U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

NUREG-2153
Volume 2

Final Safety Evaluation Report for Combined Licenses for Virgil C. Summer Nuclear Station, Units 2 and 3

Office of New Reactors

AVAILABILITY OF REFERENCE MATERIALS IN NRC PUBLICATIONS

NRC Reference Material

As of November 1999, you may electronically access NUREG-series publications and other NRC records at NRC's Public Electronic Reading Room at http://www.nrc.gov/reading-rm.html. Publicly released records include, to name a few, NUREG-series publications; *Federal Register* notices; applicant, licensee, and vendor documents and correspondence; NRC correspondence and internal memoranda; bulletins and information notices; inspection and investigative reports; licensee event reports; and Commission papers and their attachments.

NRC publications in the NUREG series, NRC regulations, and Title 10, "Energy," in the *Code of Federal Regulations* may also be purchased from one of these two sources.

1. The Superintendent of Documents
   U.S. Government Printing Office
   Mail Stop SSOP
   Washington, DC 20402–0001
   Internet: bookstore.gpo.gov
   Telephone: 202-512-1800
   Fax: 202-512-2250
2. The National Technical Information Service
   Springfield, VA 22161–0002
   www.ntis.gov
   1–800–553–6847 or, locally, 703–605–6000

A single copy of each NRC draft report for comment is available free, to the extent of supply, upon written request as follows:

Address: U.S. Nuclear Regulatory Commission
Office of Administration
Publications Branch
Washington, DC 20555-0001
E-mail: DISTRIBUTION.RESOURCE@NRC.GOV
Facsimile: 301–415–2289

Some publications in the NUREG series that are posted at NRC's Web site address http://www.nrc.gov/reading-rm/doc-collections/nuregs are updated periodically and may differ from the last printed version. Although references to material found on a Web site bear the date the material was accessed, the material available on the date cited may subsequently be removed from the site.

Non-NRC Reference Material

Documents available from public and special technical libraries include all open literature items, such as books, journal articles, transactions, *Federal Register* notices, Federal and State legislation, and congressional reports. Such documents as theses, dissertations, foreign reports and translations, and non-NRC conference proceedings may be purchased from their sponsoring organization.

Copies of industry codes and standards used in a substantive manner in the NRC regulatory process are maintained at—

The NRC Technical Library
Two White Flint North
11545 Rockville Pike
Rockville, MD 20852–2738

These standards are available in the library for reference use by the public. Codes and standards are usually copyrighted and may be purchased from the originating organization or, if they are American National Standards, from—

American National Standards Institute
11 West 42nd Street
New York, NY 10036–8002
www.ansi.org
212–642–4900

Legally binding regulatory requirements are stated only in laws; NRC regulations; licenses, including technical specifications; or orders, not in NUREG-series publications. The views expressed in contractor-prepared publications in this series are not necessarily those of the NRC.

The NUREG series comprises (1) technical and administrative reports and books prepared by the staff (NUREG–XXXX) or agency contractors (NUREG/CR–XXXX), (2) proceedings of conferences (NUREG/CP–XXXX), (3) reports resulting from international agreements (NUREG/IA–XXXX), (4) brochures (NUREG/BR–XXXX), and (5) compilations of legal decisions and orders of the Commission and Atomic and Safety Licensing Boards and of Directors' decisions under Section 2.206 of NRC's regulations (NUREG–0750).

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

NUREG-2153
Volume 2

Final Safety Evaluation Report for Combined Licenses for Virgil C. Summer Nuclear Station, Units 2 and 3

Volume 2

Docket Nos. 52-027 and 52-028

Manuscript Completed: August 2011
Date Published: September 2013

Office of New Reactors

ABSTRACT

This final safety evaluation report[1] (FSER) documents the U.S. Nuclear Regulatory Commission (NRC) staff's technical review of the combined license (COL) application submitted by South Carolina Electric and Gas Company (SCE&G or the applicant), for the Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3.

By letter dated March 27, 2008, the SCE&G, acting on behalf of itself and as agent for the South Carolina Public Service Authority (also referred to as Santee Cooper), submitted its application to the NRC for COLs for two AP1000 advanced passive pressurized-water reactors (PWRs) pursuant to the requirements of Sections 103 and 185(b) of the Atomic Energy Act of 1954, as amended; Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, certifications and approvals for nuclear power plants," and the associated material licenses under 10 CFR Part 30, "Rules of general applicability to domestic licensing of byproduct material"; 10 CFR Part 40, "Domestic licensing of source material"; and 10 CFR Part 70, "Domestic licensing of special nuclear material." These reactors are identified as VCSNS Units 2 and 3, and will be located approximately 1 mile from the center of VCSNS Unit 1 in western Fairfield County, South Carolina.

The initial application incorporated by reference 10 CFR Part 52, Appendix D, "Design Certification Rule for the AP1000 Design," and the Westinghouse Electric Corporation's (Westinghouse's) application for amendment of the AP1000 design, as described in Revision 16 of the Design Control Document (DCD) (submitted May 26, 2010) as well as Westinghouse Technical Report (TR)-134, APP-GW-GLR-134, "AP1000 DCD Impacts to Support COLA Standardization," Revision 4, which was submitted on March 20, 2008. Subsequent to the initial application, in a letter dated June 28, 2011, SCE&G submitted Revision 5 of the application that incorporates by reference AP1000 DCD Revision 19. The results of the NRC staff's evaluation of the AP1000 DCD are documented in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," and its supplements.

This FSER presents the results of the staff's review of information submitted in conjunction with the COL application, except those matters resolved as part of the referenced design certification rule. In Appendix A to this FSER, the staff has identified certain license conditions and inspections, tests, analyses and acceptance criteria (ITAAC) that the staff recommends the Commission impose, should COLs be issued to the applicant. Appendix A contains those proposed ITAAC that are discussed in this SER. In addition to the ITAAC in Appendix A, the ITAAC found in the AP1000 DCD Revision 19 Tier 1 material will also be incorporated into the COLs should COLs be issued to the applicant.

On the basis of the staff's review[2] of the application, as documented in this FSER, the staff recommends that the Commission find the following with respect to the safety aspects of the COL application: 1) the applicable standards and requirements of the Atomic Energy Act and Commission regulations have been met; 2) required notifications to other agencies or bodies have been duly made; 3) there is reasonable assurance that the facility will be constructed and

[1] This FSER documents the NRC staff's position on all safety issues associated with the combined license application. The Advisory Committee on Reactor Safeguards (ACRS) independently reviewed those aspects of the application that concern safety, as well as the advanced safety evaluation report without open items (an earlier version of this document), and provided the results of its review to the Commission in a report dated February 17, 2011. This report is included as Appendix F to this FSER.

[2] An environmental review was also performed of the COL application and its evaluation and conclusions are documented in NUREG-1939, "Final Environmental Impact Statement for Combined Licenses for Virgil C. Summer Nuclear Station Units 2 and 3," dated April 2011.

will operate in conformity with the license, the provisions of the Atomic Energy Act, and the Commission's regulations; 4) the applicant is technically and financially qualified to engage in the activities authorized; and 5) issuance of the license will not be inimical to the common defense and security or to the health and safety of the public.

CONTENTS

The chapter and section layout of this FSER is consistent with the format of (1) NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)"; (2) Regulatory Guide (RG) 1.206, "Combined License Applications for Nuclear Power Plants"; and (3) the applicant's final safety analysis report (FSAR). Where applicable, references to other regulatory actions (e.g., design certifications) are included in the text of the safety evaluation report (SER).

APPENDICES

FIGURES

TABLES

EXECUTIVE SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) regulations in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52 include requirements for licensing new nuclear power plants.[3] These regulations include the NRC's requirements for early site permits (ESP), design certification, and combined license (COL) applications. The ESP process (10 CFR Part 52, Subpart A, "Early Site Permits") is intended to address and resolve siting-related issues. The design certification process (10 CFR Part 52, Subpart B, "Standard Design Certifications") provides a means for a vendor to obtain NRC certification of a particular reactor design. Finally, the COL process (10 CFR Part 52, Subpart C, "Combined Licenses") allows an applicant to seek authorization to construct and operate a new nuclear power plant. A COL may reference an ESP, a certified design, both, or neither. As part of demonstrating that all applicable NRC requirements are met, a COL applicant referencing an ESP or certified design must demonstrate compliance with any requirements not already resolved as part of the referenced ESP or design certification proceeding before the NRC issues that COL.

This FSER describes the results of a review by the NRC staff of a COL application request submitted by South Carolina Electric and Gas (SCE&G or the applicant), acting on behalf of itself and as agent for the South Carolina Public Service Authority (also referred to as Santee Cooper) for two new reactors to be located at the Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3 site. The staff's review was to determine the applicant's compliance with the requirements of Subpart C of 10 CFR Part 52, as well as the applicable requirements under 10 CFR Parts 30, 40, and 70 governing the possession and use of applicable source, byproduct and special nuclear materials. This FSER identifies the staff's conclusions with respect to the COL safety review.

The NRC regulations also require an applicant to submit an environmental report pursuant to 10 CFR Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions." The NRC reviews the environmental report as part of the Agency's responsibilities under the National Environmental Policy Act of 1969, as amended. The NRC presents the results of that review in a final environmental impact statement (FEIS), which is a report separate from this FSER. The staff's FEIS, NUREG-1939, "Final Environmental Impact Statement for Combined Licenses (COLs) for Virgil C. Summer Nuclear Station Units 2 and 3," was issued in April 2011, and can be accessed through the Agencywide Documents Access and Management System (ADAMS) at ML11098A044 and ML11098A057.[4]

By letter dated March 27, 2008, the SCE&G, acting on behalf of itself and as agent for the South Carolina Public Service Authority (also referred to as Santee Cooper), submitted its application to the NRC for COLs for two AP1000 advanced passive pressurized-water reactors (PWRs) (ADAMS Accession No. ML081300460) to be located at the VCSNS site. SCE&G identified the two units as VCSNS Units 2 and 3. The VCSNS site is located in Fairfield County, South Carolina, approximately 15 miles west of the county seat of Winnsboro and 26 miles northwest

[3] Applicants may also choose to seek a construction permit (CP) and operating license in accordance with 10 CFR Part 50, "Domestic licensing of production and utilization facilities," instead of using the 10 CFR Part 52 process.

[4] Agencywide Documents Access and Management System (ADAMS) is the NRC's information system that provides access to all image and text documents that the NRC has made public since November 1, 1999, as well as bibliographic records (some with abstracts and full text) that the NRC made public before November 1999. Documents available to the public may be accessed via the Internet at http://www.nrc.gov/reading-rm/adams/web-based.html. Documents may also be viewed by visiting the NRC's Public Document Room at One White Flint North, 11555 Rockville Pike, Rockville, Maryland. Telephone assistance for using web-based ADAMS is available at (800) 397-4209 between 8:30 a.m. and 4:15 p.m., Eastern Time, Monday through Friday, except Federal holidays. The staff is also making this FSER available on the NRC's new reactor licensing public web site at http://www.nrc.gov/reactors/new-reactors/col/summer/documents/ser-final.html

of Columbia, the state capital. VCSNS Units 2 and 3 will be located approximately 1 mile from the center of VCSNS Unit 1.

The initial application incorporated by reference 10 CFR Part 52, Appendix D, "Design Certification Rule for the AP1000 Design," and the Westinghouse Electric Corporation's (Westinghouse's) application for amendment of the AP1000 design, as supported by Revision 16 of the Design Control Document (DCD). The initial application also incorporated by reference Westinghouse Technical Report (TR)-134, APP-GW-GLR-134, "AP1000 DCD Impacts to Support COLA Standardization," Revision 4, which was submitted on March 20, 2008. Subsequent to the initial application, in a letter dated June 28, 2011, SCE&G submitted Revision 5 of the application that incorporates by reference AP1000 DCD Revision 19. The results of the NRC staff's evaluation of the AP1000 DCD are documented in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," and its supplements.

The staff has identified in Appendix A to this FSER, certain license conditions, and inspections, tests, analyses and acceptance criteria (ITAAC) that the staff recommends the Commission impose, should COLs be issued to the applicant. Appendix A includes those proposed ITAAC that are discussed in this FSER. In addition to the ITAAC in Appendix A, the ITAAC found in the AP1000 DCD Revision 19 Tier 1 material will also be incorporated into the COLs should COLs be issued to the applicant.

Inspections conducted by the NRC have verified, where appropriate, the conclusions in this FSER. The inspections focused on selected information in the COL application and its references. The FSER identifies applicable inspection reports as reference documents.

The NRC's Advisory Committee on Reactor Safeguards (ACRS) also reviewed the bases for the conclusions in this report. The ACRS independently reviewed those aspects of the application that concern safety, as well as the advanced safety evaluation report without open items (an earlier version of this document), and provided the results of its review to the Commission in a report dated February 17, 2011. Appendix F includes a copy of the report by the ACRS on the COL application, as required by 10 CFR 52.87, "Referral to the Advisory Committee on Reactor Safeguards (ACRS)."

ABBREVIATIONS

χ/Q	atmospheric dispersion
A2LA	American Association for Laboratory Accreditation
ac	alternating current
ACI	American Concrete Institute
ACP	access control point
ACRS	Advisory Committee on Reactor Safeguards
ADAMS	Agencywide Documents Access and Management System
ADS	automatic depressurization system
AE	architect-engineer
AEA	Atomic Energy Act of 1954
AEO	Annual Energy Outlook
AFB	Air Force Base
AFFF	aqueous film forming foam
ALARA	as low as is reasonable achievable
ALI	annual limit on intake
ALWR	advanced light-water reactor
ANI	American Nuclear Insurers
ANS	Alert and Notification Systems
ANS	American Nuclear Society
ANSI	American National Standards Institute
ANSS	Advanced National Seismic System
AOO	anticipated operational occurrence
AOV	air-operated valve
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASE	advanced safety evaluation
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATE	advisory to evacuate
ATWS	anticipated transients without scram
AWWA	American Water Works Association
B&PV	Boiler and Pressure Vessel (ASME BPV Code)
BDBE	beyond-design basis event
BL	Bulletin
BLN	Bellefonte Nuclear Station
BLRA	Base Load Review Act
BOP	balance of plant
bpf	blows per foot
BTP	Branch Technical Position
BWR	boiling-water reactor
C	Celsius
C&C	command & control
CAE	Columbia Metropolitan Airport

CAS	central alarm station
CAV	cumulative absolute velocity
CCS	component cooling water system
CDA	critical digital asset
CDF	core damage frequency
CDI	conceptual design information
CDM	certified design material
CECC	Central Emergency Control Center
CEUS	Central and Eastern United States
CFR	*Code of Federal Regulations*
cfs	cubic feet per second
cGy	centiGray
cm	centimeters
CMT	core makeup tank
COL	combined license
CP	construction permit
CPSZ	Central Piedmont Shear Zone
CPT	cone penetration test
CR	control room
CRDM	control rod drive mechanism
CRDS	control rod drive system
CS	containment system
CS	core supports
CS	critical system
CSA	control support area
CSDRS	certified seismic design response spectra
CSP	Cyber Security Plan
CST	cyber security team
CTA	critical target area
CVCS	chemical and volume control system
CVS	portions of chemical and volume control system
CWIP	construction work in process
CWS	circulating water system
DAC	derived air concentration
DAS	Diverse Actuation System
DBA	design-basis accident
DBE	design-basis event
DBT	design-basis threat
dc	direct current
DC	design certification
DCA	design certification amendment
DCD	design control document
DCP	Design Change Package
DCRA	design-centered review approach
DECLG	double-ended cold leg guillotine
DECT	Digital Enhanced Cordless Telecommunication
DEIS	Draft Environmental Impact Statement
DEP	Departure
DEP	dose evaluation periphery
DG	diesel generator

DHEC	Department of Health and Environmental Control
DHS	Department of Homeland Security
DNBR	departure from nucleate boiling ratio
DOE	Department of Energy
DOT	Department of Transportation
D-RAP	Design Reliability Assurance Program
DTS	demineralized water treatment system
DWS	demineralized water system
EAB	exclusion area boundary
EAL	emergency action level
EAS	Emergency Alert System
ECCS	emergency core cooling system
ECFS	East Coast Fault System
ECMA	East Coast Magnetic Anomaly
ED	Emergency Director
EDMG	Extensive Damage Mitigation Guidelines
EIA	Energy Information Agency
EIS	Environmental Impact Statement
El.	Elevation
ELS	plant lighting system
ENS	Emergency Notification System
EOC	emergency operation center
EOF	emergency operations facility
EOP	emergency operating procedure
EOP	emergency operating plan
EP	Emergency Plan
EP	emergency planning
EPA	Environmental Protection Agency
EPAct	Energy Policy Act of 2005
EPC	engineering, procurement, and construction
EPFZ	Eastern Piedmont fault zone
EPI	emergency public information
EPIO	Emergency Public Information Office
EPIP	emergency plan implementing procedure
EP-ITAAC	emergency planning-inspections, tests, analyses, and acceptance criteria
EPM	Emergency Plant Manager
EPOS	Emergency Plant Operations Supervisor
EPRI	Electric Power Research Institute
EPZ	emergency planning zone
EQ	environmental qualification
EQMEL	Environmental Qualification Master Equipment List
ER	Environmental Report
ERDS	emergency response data system
ERF	emergency response facility
ERO	emergency response officer
ERO	Emergency Response Organization
ESF	emergency support function
ESF	engineered safety feature
ESP	Early Site Permit
ESSX	Electric Switch System Exchange

EST	earth science team
ETE	evacuation time estimate
ETSZ	Eastern Tennessee Seismic Zone
F	Fahrenheit
FAA	Federal Aviation Administration
FAC	flow-accelerated corrosion
FBI	Federal Bureau of Investigation
FCEMS	Fairfield County Emergency Medical Services
FDT	fire dynamics tool
FDW	Fairfield County Airport
FEIS	final environmental impact statement
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FFD	fitness for duty
FIRS	foundation input response spectra
FIV	flow induced vibration
FMCRD	fine motion control rod drive
FMEA	failure mode and effects analysis
FP	fire protection
fps	feet per second
FPS	fire protection system
FPSF	Fairfield Pumped Storage Facility
FR	*Federal Register*
FRS	floor response spectra
FS	factory of safety
FSAR	final safety analysis report
FSER	final safety evaluation report
ft	feet
FTS	Federal Telecommunications System
GDC	General Design Criteria (Criterion)
GIS	geographical information system
GL	Generic Letter
GMRS	ground motion response spectra
gpm	gallons per minute
GSI	Generic Safety Issue
GSU	generator step-up
GTS	generic technical specification
GWMS	gaseous waste management system
HCCWS	high capacity chilled water subsystem
HCLPF	high confidence, low probability of failure
HCM	Highway Capacity Manual
HCU	hydraulic control unit
HDPE	high-density polyethylene
HEPA	high efficiency particulate air
HFE	human factors engineering
HMR	Hydro-meteorological Report
HP	health physics
HPN	Health Physics Network

HPS	Health Physics Society
HR	hard rock
HRA	human reliability analysis
HRHF	hard rock high frequency
HSI	human-system interface
HV	high voltage
HVAC	heating, ventilation, and air conditioning
Hz	Hertz
I&C	instrumentation and control
IBC	International Building Code
ICMO	interim compensatory order
IDLH	immediate danger to life and health
IED	Interim Emergency Director
IEEE	Institute of Electrical and Electronic Engineers
IFR	Interim Findings Report
IGSCC	intergranular stress corrosion cracking
IHP	integrated head package
IIS	incore instrumentation system
ILAC	International Laboratory Accreditation Cooperation
in	inch
INPO	Institute of Nuclear Power Operations
IPEEE	Individual Plant Examination of External Events
IPSAC	Investment Protection Short-Term Availability Control
IPZ	ingestion pathway emergency planning zone
IRWST	in-containment refueling water storage tank
ISA	independent safety assessment
ISA	Instrument Society of America
ISFSI	independent spent fuel storage installation
ISG	Interim Staff Guidance
ISI	inservice inspection
ISRS	in-structure response spectra
IST	inservice testing
ITAAC	inspections, tests, analyses, and acceptance criteria
ITP	Initial Test Program
JFD	joint frequency distribution
JIC	Joint Information Center
JOG	Joint Owners Group
JTWG	Joint Test Working Group
kg/m^3	kilogram per cubic meter
KI	potassium iodide
km	kilometers
kPa	kilopascal
ksf	kips per square foot
ksi	kilopascal per square inch
kV	kilovolt
kVA	kilovolt amp
kWe	kilowatt electric

LAN	Local Area Network
lb/ft^2	pounds per square foot
LBB	leak-before-break
LCCWS	low capacity chilled water subsystem
LCD	Local Climatological Data
LCEMS	Lexington County Emergency Medical Services
LCO	limiting condition for operation
LEFM	Leading Flow Edge Meter
LLEA	local law enforcement agency
LLHS	light load handling system
LLNL	Lawrence Livermore National Laboratory
LOA	letter of agreement
LOCA	loss-of-coolant accident
LOLA	loss of large area
LOOP	loss of offsite power
LPZ	low population zone
LRF	large release frequency
LSS	low strategic significance
LTOP	low-temperature overpressure protection
LWA	Limited Work Authorization
LWMS	liquid waste management system
LWR	light-water reactor
M	magnitude
m	meter
m/s	meters per second
m^3/s	cubic meters per second
Ma	million years ago
m_b	body-wave magnitude
Mbtu/hr	one million British thermal units/hour
MC	metal containment
MC&A	material control and accounting
MCL	Management Counterpart Link
MCR	main control room
M_d	duration magnitude
MEI	maximally exposed individual
MERT	Medical Emergency Response Team
mGy	milliGray
mi	miles
MIT	Massachusetts Institute of Technology
M_L	local magnitude
mm	millimeters
MMI	Modified Mercalli Intensity
M-O	Mononobe-Okabe
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MOV	motor-operated valve
MOX	mixed-oxide
MPA	methoxypropylamine
mph	miles per hour
MR	Maintenance Rule

MRA	Mutual Recognition Arrangement
mrad	millirad
mrem	millirem
MSD	Mitigative Strategies Description
msl	mean sea level
MSLB	main steam line break
MSSS	main steam supply system
MST	Mitigative Strategies Table
mSv	milliSievert
MT	magnetic particle
MUR	measurement uncertainty recapture
MVA	megavolt ampere
MVAR	mega volt amp reactive
MW	megawatts
MWe	megawatts electric
MWt	megawatts thermal
my	million years
N	North
NCDC	National Climatic Data Center
NDCT	natural draft cooling tower
NDL	nuclear data link
NEA	Nuclear Energy Agency
NEI	Nuclear Energy Institute
NERC	North American Electric Reliability Corporation
NFPA	National Fire Protection Association
NI	nuclear island
NIRMA	Nuclear Information and Records Management Association
NIST	National Institute of Standards and Technology
NMSZ	New Madrid Seismic Zone
NND	new nuclear deployment
NNS	non-nuclear safety
NOAA	National Oceanic and Atmospheric Administration
NOV	Notice of Violation
NPPENF	Nuclear Power Plant Emergency Notification Form
NRC	U.S. Nuclear Regulatory Commission
NRF	National Response Framework
NRO	Office of New Reactors
NS	nonseismic
NSSS	nuclear steam supply system
NSSS	nuclear steam system supplier
NUMARC	Nuclear Management and Resources Council
NVLAP	National Voluntary Laboratory Accreditation Program
NWS	National Weather Service
NYAL	New York-Alabama
OBE	operating basis earthquake
OCA	owner controlled area
ODCM	Offsite Dose Calculation Manual
OE	operating experience
OER	operating experience review

OHLHS	overhead heavy load handling system
OM	Operation and Maintenance (ASME OM Code)
OPRAA	operational phase reliability assurance activity
ORE	occupational radiation exposure
ORM	Onsite Radiation Manager
OSC	Operational Support Center
OSHA	Occupational Safety and Health Administration
PA	protected area
PAD	protective action decision
PAG	protective action guideline
PAP	primary access point
PAR	protective action recommendation
PAZ	protective action zone
PBA	power block area
PBAC	power block area circle
PBX	Private Branch Exchange
PCCAWST	passive containment cooling ancillary water storage tank
PCCWST	passive containment cooling water storage tank
pcf	pounds per cubic foot
PCP	Process Control Program
PCS	passive containment cooling system
PDP	procedure development program
PF	performance goal
PGA	peak ground acceleration
PGP	procedures generation package
PM	preventive maintenance
PMCL	Protective Measures Counterpart Link
PMF	probable maximum flood
PMH	probable maximum hurricane
PMP	probable maximum precipitation
PMS	protection and safety monitoring
PMT	probable maximum tsunami
PMWP	probable maximum winter precipitation
PMWS	probable maximum wind storm
PORV	power-operated relief valve
POV	power-operated valve
ppm	parts per million
PRA	probabilistic risk assessment
PRHR	passive residual heat removal
P-S	primary-shear velocity
psf	pounds per square foot
PSHA	probabilistic seismic hazard analysis
PSI	preservice inspection
psi	pounds per square inch
psig	pounds per square inch gauge
PS-ITAAC	physical security inspections, tests, analyses, and acceptance criteria
PSP	Physical Security Plan
P-T	pressure temperature
PT	liquid penetrant
PT&O	plant test and operations

PTLR	pressure-temperature limits report
PTS	pressurized thermal shock
PTS	plant-specific technical specifications
PVC	polyvinyl chloride
PWR	pressurized-water reactor
PWS	potable water system
PWSCC	primary water stress corrosion cracking
PXS	passive core cooling system
QA	quality assurance
QAPD	Quality Assurance Program description
QAPD	Quality Assurance Program Document
QC	quality control
QDF	queue discharge flow
QG	quality group
RAI	request for additional information
RAP	reliability assurance program
RAT	reserve auxiliary transformer
RCCA	rod cluster control assembly
RCL	reactor coolant loop
RCM	Response Coordination Manual
RCOL	reference combined license
RCP	reactor coolant pump
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RCTS	resonant column torsional shear
REAC/TS	Radiation Emergency Assistance Center/Training Site
rem	roentgen equivalent man
REP	radiological emergency preparedness
RG	regulatory guide
RIS	Regulatory Issue Summary
RLE	review-level earthquake
RMS	radiation monitoring system
RNS	residual heat removal system
RO	reactor operator
RPP	Radiation Protection Program
RPV	reactor pressure vessel
RQD	rock quality designation
RRS	required response spectrum
RSCL	Reactor Safety Counterpart Link
RTDP	revised thermal design procedure
RTM	Response Technical Manual
RT_{NDT}	nil-ductility reference transition temperature
RTNSS	regulatory treatment of nonsafety systems
RTP	rated thermal power
RT_{PTS}	pressurized thermal shock reference temperature
RV	reactor vessel
RVSP	reactor vessel surveillance capsule program
RWS	raw water system
RXS	reactor system

S&PC	steam and power conversion
SACTI	Seasonal/Annual Cooling Tower Impact
SAMG	severe accident management guidance
SAR	safety analysis report
SAS	secondary alarm station
SAT	systematic approach to training
SBO	station blackout
SC	South Carolina
SCBA	self-contained breathing apparatus
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SCDOT	South Carolina Department of Transportation
SCDPRT	South Carolina Department of Parks, Recreation, and Tourism
SCE&G	South Carolina Electric and Gas Company
SCEMD	South Carolina Emergency Management Division
SCFFMP	South Carolina Fire Fighter Mobilization Plan
SCOL	subsequent combined license
SCP	Safeguards Contingency Plan
SCPSC	South Carolina Public Service Commission
SCSCO	South Carolina State Climatology Office
SCSN	South Carolina State Network
SDS	sanitary drainage system
SDWIS	Safe Drinking Water Information System
SE	safety evaluation
SEC	Securities and Exchange Commission
SECY	Secretary of the Commission, Office of the Nuclear Regulatory Commission
SEI	Structural Engineering Institute
SEPA	Southeastern Power Administration
SER	safety evaluation report
SERC	Southeastern Electric Reliability Council
SEUSSN	South Eastern United States Seismic Network
SFP	spent fuel pool
SFS	spent fuel pool cooling system
SG	steam generator
SGI	safeguards information
SGTR	steam generator tube rupture
SMA	seismic margin analysis
SNC	Southern Nuclear Operating Company
SNM	special nuclear material
SNMPPP	Special Nuclear Material Physical Protection Program
SOG	Seismicity Owners Group
SOT	station orientation training
SP	Setpoint Program
SPDS	safety parameter display system
SPT	standard penetration test
sq mi	square mile
SR	surveillance requirement
SRM	Staff Requirements Memorandum
SRO	senior reactor operator
SRP	standard review plan

SSAR	Site Safety Analysis Report
SSCs	structures, systems, and components
SSE	safe shutdown earthquake
SSEP	safety, security and/or emergency preparedness
SSHAC	Senior Seismic Hazard Analysis Committee
SSI	soil-structure interaction
SS-ITAAC	site-specific inspections, tests, analyses and acceptance criteria
SSRS	square root sum of squares
STD	Standard
STS	standard technical specification
SUNSI	Sensitive Unclassified Non-Safeguards Information
SUP	Supplement
Sv	Sievert
SWMS	solid waste management system
SWS	service water system
T&QP	Training and Qualification Plan
TAG	Technical Advisory Group
TCP	traffic control point
TCS	turbine building closed cooling water system
TEDE	total effective dose equivalent
TG	turbine-generator
TGS	turbine generator system
TIP	Trial Implementation Project
TLD	thermoluminescent dosimeter
TMI	Three Mile Island
TR	technical report
TRS	test response spectrum
TS	technical specification
TSC	Technical Support Center
TSO	transmission system operator
TSTF	Technical Specification Task Force Traveler
TSTF	Technical Specification Task Force
TVA	Tennessee Valley Authority
U	unconfined compressive strength
UAT	unit auxiliary transformer
UBC	Uniform Building Code
UCSS	updated Charleston seismic source
UFM	ultrasonic flow meter
UFSAR	Updated Final Safety Analysis Report
UHRS	uniform hazard response spectra
UHS	ultimate heat sink
UPS	uninterruptible power supply
USACE	United States Army Corps of Engineers
USE	upper shelf energy
USGCRP	United States Global Change Research Program
USGS	United States Geological Survey
UT	ultrasonic
UTM	universal transverse Mercator

V&V	verification and validation
V/H	vertical-to-horizontal
VACAR	Virginia-Carolina
VAR	volt amp reactive
VBS	nuclear island nonradioactive ventilation system
VBS	vehicle barrier system
VCSNS	V.C. Summer Nuclear Station
Vdc	volts direct current
VEGP	Vogtle Electric Generating Plant
VES	main control room emergency habitability system
VFS	containment air filtration system
VHRA	very high radiation area
V_P	compression wave velocity
VPN	Virtual Private Network
V_S	shear wave velocity
VWS	chilled water system
W	West
WAC	waste acceptance criteria
WCAP	Westinghouse Commercial Atomic Power
WEC	Westinghouse Electric Company
WLS	liquid radwaste system
WWRB	waste water retention basin
WWS	waste water system
YFS	yard fire system
ZPA	zero period acceleration

7.0 INSTRUMENTATION AND CONTROLS

Nuclear power plant instrumentation senses various plant parameters and transmits appropriate signals to the control systems during normal operation and to the reactor trip and engineered safety feature systems during abnormal and accident conditions. The information provided in this chapter emphasizes those instruments and associated equipment that constitute the protection and safety systems.

7.1 Introduction

7.1.1 Introduction

Westinghouse (WEC) proposed to revise the AP1000 Design Control Document (DCD) to address final setpoint calculations for protective functions. These proposed changes to the DCD impact the AP1000 combined license (COL) applications.

7.1.2 Summary of Application

Section 7.1 of the V.C. Summer Nuclear Station (VCSNS) COL Final Safety Analysis Report (FSAR), Revision 5 incorporates by reference Section 7.1 of the AP1000 DCD, Revision 19. The advanced safety evaluation (ASE) with confirmatory items for Section 7.1 was based on the VCSNS COL FSAR, Revision 2 and DCD Revision 17. After submitting DCD Revision 17 to the NRC, Westinghouse created a new COL Information Item (COL 7.1-1). This COL information item has been incorporated into Revision 18 of the DCD; however, the discussion of the COL information item below did not change.

In addition, the applicant proposed the following:

AP1000 COL Information Item

- STD COL 7.1-1

In a letter dated March 8, 2010, WEC proposed to revise the AP1000 DCD by adding COL Information Item 7.1-1 to address final setpoint calculations. In a letter dated August 5, 2010, the applicant proposed a revision to the VCSNS COL FSAR by adding Standard (STD) COL 7.1-1, “Setpoint Calculations for Protective Functions” to reflect the above.

7.1.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793, “Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design,” and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for Instrumentation and Controls are in Section 7.1 of NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants.”

The applicable regulatory requirements for the information being reviewed in this section are:

- Title 10 of the *Code of Federal Regulations* (10 CFR) 50.36
- 10 CFR 52.79(a)(30)

7.1.4 Technical Evaluation

The Nuclear Regulatory Commission (NRC) staff reviewed Section 7.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[5] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to safety-related display information. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this safety evaluation report (SER) provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the design certification (DC) and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (Vogtle Electric Generating Plant (VEGP), Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs).

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) may include evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 7.1.4 of the VEGP SER:

> *The applicant, in its letter dated May 21, 2010, proposed to incorporate the Setpoint Program (SP) that will be added to the AP1000 DCD into the VEGP Technical Specifications (TS). This proposal was made to address Open Item 16.1-1. In Chapter 16 of this safety evaluation report (SER), the staff concludes that the response to Open Item 16.1-1 is acceptable. The*

[5] See Section 1.2.2 for a discussion of the staff's review related to verification of the scope of information to be included in a COL application that references a design certification (DC).

*incorporation of this program into the VEGP TS in a later revision is being tracked as **Confirmatory Item 16.1-1**. The closure of this Confirmatory Item is provided in SER Section 16.1.*

In addition, in a letter dated June 4, 2010, the applicant proposed adding STD COL 7.1-1 as a new COL information item addressed in the VEGP COL FSAR.

AP1000 COL Information Item

- *STD COL 7.1-1*

The applicant proposed adding a new line item to VEGP COL FSAR Table 1.8-202 to address COL Information Item 7.1-1. The applicant also proposed the following addition to VEGP COL FSAR Section 7.1:

> *7.1.6.1 Setpoint Calculations for Protective Functions*
>
> *The Setpoint Program described in Technical Specifications Section 5.5 provides the appropriate controls for update of the instrumentation setpoints following completion of the calculation of setpoints for protective functions and the reconciliation of the setpoints against the final design.*

The applicant states that the TS program identified in the proposed Section 7.1.6.1 was that addressed in the VEGP revised response to Bellefonte Nuclear Plant (BLN) Open Item 16.1-1, dated May 21, 2010, and that the calculation and reconciliation of the setpoints discussed is required by the AP1000 Inspections, Tests, Analyses and Acceptance Criteria (ITAAC) included in AP1000 DCD Tier 1, Table 2.5.2-8, Item 10. In Chapter 16 of this SER, the staff concludes that the May 21, 2010, response to BLN Open Item 16.1-1 is acceptable.

*Based on the ITAAC in Table 2.5.2-8, Item 10 and the TS controls in Section 5.5, the staff finds there are adequate controls for updating the instrumentation and controls (I&C) setpoints. Therefore, the staff finds STD COL 7.1-1 acceptable. The incorporation of the changes associated with proposed STD COL 7.1-1 into a future revision of the VEGP COL FSAR is **Confirmatory Item 7.1-1**.*

Resolution of Standard Content Confirmatory Item 7.1-1

Confirmatory Item 7.1-1 is an applicant commitment to revise its FSAR Table 1.8-202 and Section 7.1 to address COL Information Item STD COL 7.1-1. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 7.1-1 is now closed.

7.1.5 Post Combined License Activities

There are no post-COL activities related to this section.

7.1.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to setpoint calculations for protective functions, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff has compared the application to the relevant NRC regulations and other NRC regulatory guides and concludes that the applicant is in compliance with the NRC regulations. The staff based its conclusion on the following:

- STD COL 7.1-1, the applicant provided a program for setpoint calculations for protective functions in accordance with the requirements of 10 CFR 50.36 and 10 CFR 52.79(a)(30).

7.2 Reactor Trip

Section 7.2 of the VCSNS COL FSAR, Revision 5 incorporates by reference, with no departures or supplements, Section 7.2, "Reactor Trip," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

7.3 Engineered Safety Features

Section 7.3 of the VCSNS COL FSAR, Revision 5 incorporates by reference, with no departures or supplements, Section 7.3, "Engineered Safety Features," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In RAI 1-4, issued to the applicant for the BLN, Units 3 and 4, the staff questioned how the applicant would verify that the as-built I&C system configuration conformed to schematics. In its response to RAI 1-4, the BLN applicant indicated that it or a designee would verify I&C cabinets as-built against the design drawings during manufacturing and would functionally test each system. In addition, the BLN applicant's response indicated that the I&C cabinets would be tested during preoperational testing and in accordance with several ITAAC related to the I&C system. The BLN response to RAI 1-4 was endorsed as standard for VCSNS by South Carolina Electric and Gas Company (SCE&G) in its letter dated May 12, 2009.

The staff notes that vendor qualification testing, which may be done offsite, and preoperational testing fall under the applicant's quality assurance program. Any anomalies found during the testing or any problems identified from the time the testing is complete until the components are installed at the site would be corrected in accordance with the applicant's quality assurance program. The staff finds the verification of the as-built I&C system configuration against

schematics using a combination of vendor and onsite testing that falls under the applicant's quality assurance program acceptable. In addition, the staff finds that adequate program controls exist to ensure that once the testing was complete, the I&C system configuration would be maintained as valid throughout the life of the plant. Based on the above, the staff finds the response to BLN RAI 1-4 and the SCE&G endorsement of that response acceptable.

7.4 Systems Required for Safe Shutdown

Section 7.4 of the VCSNS COL FSAR, Revision 5 incorporates by reference, with no departures or supplements, Section 7.4, "Systems Required for Safe Shutdown," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

7.5 Safety-Related Display Information (Related to RG 1.206, Section C.III.1, Chapter 7, C.1.7.5, "Information Systems Important to Safety")

7.5.1 Introduction

Safety-related display information includes equipment that processes safety-related information and displays it for use by the operator to monitor and maintain the safety of the AP1000 throughout operating conditions that include anticipated operational occurrences and accident and post-accident conditions.

7.5.2 Summary of Application

Section 7.5 of the VCSNS COL FSAR, Revision 5 incorporates by reference Section 7.5 of the AP1000 DCD, Revision 19. The ASE with confirmatory items for Section 7.5 was based on the VCSNS COL FSAR, Revision 2 and DCD Revision 17. After submitting DCD Revision 17 to the NRC, Westinghouse created a new COL Information Item (COL 7.5-1). This COL information item has been incorporated into Revision 18 of the DCD; however, the discussion of the COL information item below did not change.

In addition, in VCSNS COL FSAR Section 7.5, the applicant provided the following:

Supplemental Information

- VCS SUP 7.5-1

The applicant provided additional information in VCSNS COL FSAR Section 7.5, "Safety-Related Display Information," describing the FSAR Table 7.5-201 supplement (SUP) to DCD Table 7.5-1 and providing variable data shown in the DCD table as "site specific."

The applicant also provided additional information in VCSNS COL FSAR Section 7.5, describing the FSAR Table 7.5-202 supplement to DCD Table 7.5-8 and providing variable data shown in DCD Table 7.5-8 as "site specific."

In addition, the applicant provided the following:

AP1000 Information Items

- STD COL 7.5-1
- VCS COL 7.5-1

In a letter dated May 26, 2010, in response to DCD Open Item OI-SRP7.5-ICE-01, WEC proposed to revise the AP1000 DCD adding COL Information Item 7.5-1 for site-specific post accident monitoring variables. In a letter dated August 5, 2010, the applicant proposed a revision to VCSNS COL FSAR by replacing VCS SUP 7.5-1 with STD COL 7.5-1 and VCS COL 7.5-1 to reflect the above.

7.5.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the Final Safety Evaluation Report related to the DCD.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the information systems important to safety are given in Section 7.5 of NUREG-0800.

The applicable regulatory requirements, guidelines, and related acceptance criteria for the supplemental information item are as follows:

- General Design Criterion (GDC) 13, "Instrumentation and Control"
- GDC 64, "Monitoring Radioactivity Releases"

The regulatory bases require, in part, that instrumentation be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to ensure adequate safety. Monitoring should include checking the plant environs for radioactivity that may be released from postulated accidents.

7.5.4 Technical Evaluation

The NRC staff reviewed Section 7.5 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to safety-related display information. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Supplemental Information

- VCS SUP 7.5-1 (Replaced by proposed VCS COL 7.5-1 and STD COL 7.5-1)

The AP1000 DCD references and commits to Regulatory Guide (RG) 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident," Revision 3, as the method of complying with GDC 13 and GDC 64.

Appendix 1AA of VCSNS COL FSAR, Revision 2 takes exception to Revision 4 of RG 1.97. The applicant, instead, states conformance to Revision 3 of RG 1.97. The applicant states, "Portable equipment outside the DCD scope conforms to Revision 3 of this Regulatory Guide for consistency with DCD scope since Revision 4 indicates that partial implementation is not advised." The staff discusses the acceptability of Revision 3 of RG 1.97 in Section 12.1 of this SER.

Revision 3 of RG 1.97 states that the variable and range information should be provided for environs radiation and radioactivity, and meteorological instrumentation.

The staff issued RAI 7.5-1 requesting information on boundary environs radiation and meteorological instrumentation. The staff finds that the range of the boundary environs radiation instruments is necessary to ensure that the instruments are adequate for monitoring radioactivity that may be released from a postulated accident. The applicant provided a supplemental response to RAI 7.5-1 with sufficient meteorological range and accuracy information for wind direction, wind speed, and differential temperature. In addition, the revised VCSNS COL FSAR Table 7.5-201 included the boundary environs radiation variable and the required range information for the post-accident monitoring system. The supplemental information conforms to the guidance of Revision 3 of RG 1.97. The staff confirmed that the VCSNS COL FSAR was updated to incorporate the instrumentation supplemental information. The staff finds the response acceptable and considers RAI 7.5-1 closed.

In a letter dated May 26, 2010, WEC proposed a change to the AP1000 DCD to add COL Information Item 7.5-1 requiring that COL applicants provide information for variables listed as "site specific" in DCD Tables 7.5-1 and 7.5-8. Although this information was provided for VCSNS as part of VCS SUP 7.5-1 and incorporated in the VCSNS COL FSAR, the identification of COL Information Item 7.5-1 in the DCD required that the applicant address this information with a COL identifier rather than as supplemental information. Accordingly, the applicant's letter dated August 5, 2010, proposes to replace VCS SUP 7.5-1 with STD COL 7.5-1 (for standard information) and VCS COL 7.5-1 (for VCSNS-specific information). This change of identifiers does not impact the staff's conclusion regarding the instrumentation information added to the VCSNS COL FSAR. The incorporation of the changed identifiers into the VCSNS COL FSAR is **Confirmatory Item 7.5-1**.

Resolution of Confirmatory Item 7.5-1

Confirmatory Item 7.5-1 is an applicant commitment to revise its FSAR Tables 1.8-202, 1.8-203 and Sections 7.5.2 and 7.5.3.5 to address COL Information Item STD COL 7.5-1. The staff verified that the VCSNS COL FSAR was appropriately revised. As a result, Confirmatory Item 7.5-1 is now closed.

7.5.5 Post Combined License Activities

There are no post-COL activities related to this section.

7.5.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to safety-related display information, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff has compared the application to the relevant NRC regulations and other NRC RGs and concludes that the applicant is in compliance with the NRC regulations. The applicant has satisfactorily addressed the guidance of Revision 3 of RG 1.97 through the response to RAI 7.5-1. The staff based its conclusion on the following:

- In VCS SUP 7.5-1 (replaced by VCS COL 7.5-1 and STD COL 7.5-1), the applicant provided sufficient information regarding the safety-related display information, which is, therefore, acceptable in accordance with the requirements of 10 CFR Part 50, Appendix A, GDC 13 and GDC 64.

7.6 Interlock Systems Important to Safety

Section 7.6 of the VCSNS COL FSAR, Revision 5 incorporates by reference, with no departures or supplements, Section 7.6, "Interlock Systems Important to Safety," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

7.7 Control and Instrumentation Systems (Related to RG 1.206, Section C.III.1, Chapter 7, C.I.7.7, "Control Systems Not Required for Safety")

Section 7.7 of the VCNSN COL FSAR, Revision 5 incorporates by reference, with no departures or supplements, Section 7.7, "Control and Instrumentation Systems," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

8.0 ELECTRIC POWER

The electric power system is the source of power for station auxiliaries during normal operation and for the reactor protection system and engineered safety features during abnormal and accident conditions. This chapter provides information on the functional adequacy of the offsite power systems and safety-related onsite electric power systems, as applicable to the AP1000 passive design, and ensures that these systems have adequate capacity, capability, redundancy, independence, and testability in conformance with the current criteria established by the U.S. Nuclear Regulatory Commission (NRC).

8.1 Introduction

8.1.1 Introduction

This section provides the applicant's description of the offsite power system with regard to the interrelationships between the nuclear unit, the utility grid, and the interconnecting grids.

In addition, this section includes a regulatory requirements applicability matrix that lists all design bases, criteria, regulatory guides (RGs), standards, and other documents to be implemented in the design of the electrical systems that are beyond the scope of the design certification (DC).

8.1.2 Summary of Application

Section 8.1 of the V.C. Summer Nuclear Station (VCSNS) combined license (COL) Final Safety Analysis Report (FSAR), Revision 5, incorporates by reference Section 8.1 of the AP1000 Design Control Document (DCD), Revision 19.

In addition, in VCSNS COL FSAR Section 8.1, the applicant provided the following:

Supplemental Information

- VCS SUP 8.1-1

The applicant provided supplemental (SUP) information in VCSNS COL FSAR Section 8.1, "Introduction," describing VCSNS's connections to South Carolina Electric and Gas (SCE&G), Santee Cooper and Duke Energy transmission systems via the 230 kilovolt (kV) switchyard at the plant site.

- VCS SUP 8.1-2

The applicant provided supplemental information in VCSNS COL FSAR Section 8.1 describing additional information pertaining to regulatory guides and Institute of Electrical and Electronics Engineers (IEEE) standards identified in AP1000 DCD Table 8.1-1 and to other applicable regulatory guides as indicated in VCSNS COL FSAR Table 8.1-201.

8.1.3 Regulatory Basis

The regulatory basis for the information incorporated by reference is addressed in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the introduction to the electric power systems are given in Section 8.1 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)."

The applicable regulatory requirements, guidelines, and related acceptance criteria for the supplemental information items are as follows:

- Title 10 of the *Code of Federal Regulations* (10 CFR) 50.63, "Loss of All Alternating Current Power"
- RG 1.155, "Station Blackout"
- RG 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)"

8.1.4 Technical Evaluation

The NRC staff reviewed Section 8.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[6] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the introduction to the electric power systems. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the following information in the VCSNS COL FSAR:

Supplemental Information

- VCS SUP 8.1-1

The NRC staff reviewed the supplemental information related to VCSNS's connections to the SCE&G, Santee Cooper and Duke Energy transmission systems via the 230kV switchyard at the plant site.

The NRC staff reviewed the resolution to the supplemental information VCS SUP 8.1-1 related to VCSNS's connections to various transmission systems. The staff determined that additional information was needed to complete the technical evaluation of this item. In request for additional information (RAI) 8.1-1, the staff asked the applicant to provide a description of the utility grid including transmission owner(s), transmission operator(s) and the North American Electric Reliability Corporation (NERC), including existing reactors at the site and their

[6] See Section 1.2.2 for a discussion of the staff's review related to verification of the scope of information to be included in a COL application that references a design certification (DC).

respective connections to the transmission grid. In a letter dated February 10, 2009, the applicant provided such description as follows:

> The VCSNS site consists of the existing VCSNS Unit 1 and the new VCSNS Units 2 and 3 reactors. VCSNS Unit 1 connects to the 115kV and 230kV SCE&G transmission systems via an existing 230kV switchyard and a 115kV transmission line. VCSNS Units 2 and 3 will connect to the 230kV SCE&G transmission system via a new 230kV switchyard. The SCE&G transmission system operator (TSO) is responsible for the safe and reliable operation of the electrical transmission system. The SCE&G transmission system consists of interconnected hydro plants, fossil-fueled plants, combustion turbine units and nuclear plants supplying energy to the service area at various voltages up to 230kV. The transmission system is interconnected with neighboring utilities, and together, they form the Virginia-Carolina (VACAR) Sub region of the Southeastern Electric Reliability Council (SERC). As of January 2009, interconnected systems at 115kV and 230kV include Santee Cooper, Duke Energy, Progress Energy (East), Southeastern Power Administration (SEPA), and Southern Company.

The applicant committed to revise the FSAR to show the information presented above.

Subsequently, in Revision 2 to the FSAR the applicant provided the information requested by the staff. The NRC staff finds that the applicant has adequately described the VCSNS Units 2 and 3 connections to the utility grid and the information provided is in accordance with the recommendations of RG 1.206 and the guidance in Section 8.1 of NUREG-0800.

The NRC staff has verified that VCSNS has updated the FSAR to include the above-mentioned items and therefore, this item is resolved.

- VCS SUP 8.1-2

The NRC staff also reviewed supplemental information included in VCS SUP 8.1-2, related to regulatory guidelines and industry standards and found it to be consistent with Section 8.1 of NUREG-0800 with the exception of the information discussed below.

VCS COL FSAR Table 8.1-201, 1b indicated that RG 1.155 is not applicable to VCSNS. This item was deemed as standard among COL applications being discussed in Bellefonte's (BLN) response to RAI 8.1-2. In a letter dated May 12, 2009, VCSNS stated that the standard response to RAI 8.1-2 applies to the VCSNS COL application.

The standard response submitted by BLN in a letter dated June 24, 2008, is summarized as follows. BLN stated that the AP1000 design meets the requirements of 10 CFR 50.63 for 72 hours and, therefore, no specific procedures or training specific to station blackout (SBO) are necessary. The NRC staff found the above response to be inconsistent with the recommendations of RG 1.155 and the requirements of 10 CFR 50.63. The staff recognizes that the passive systems can maintain safe-shutdown conditions after design-basis events for 72 hours, without operator action, following a loss of both onsite and offsite alternating current (ac) power sources. However, the applicant needs to establish SBO procedures and training for operators to include actions necessary to restore offsite power after 72 hours by addressing ac power restoration (e.g., coordination with transmission system load dispatcher), and severe

weather guidance (e.g., identification of site-specific actions to prepare for the onset of severe weather such as an impending tornado) in accordance with RG 1.155, Positions C.2 and C.3.4.

Several discussions were held between the NRC staff and the applicant regarding this issue. Subsequently, in a letter dated April 15, 2009, the BLN applicant stated that the training and procedures to support mitigation of an SBO event would be implemented in accordance with BLN COL FSAR Sections 13.2 and 13.5, respectively. As recommended by NUMARC 87-00, "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors," which is endorsed by RG 1.155, the loss of all ac power event mitigation procedures will address response (e.g., restoration of onsite power sources), ac power restoration (e.g., coordination with transmission system load dispatcher), and severe weather guidance (e.g., identification of actions to prepare for the onset of severe weather such as an impending tornado), as applicable. In addition, the applicant stated that there are no nearby large power sources, such as a gas turbine or black start fossil fuel plant that can directly connect to the station to mitigate the event.

In a letter dated January 20, 2010, VCSNS endorsed BLN's revised response.

The NRC staff has verified that VCSNS has updated Sections 1.9.5.1.5 and 1.9.6 of the VCSNS COL FSAR to include the above-mentioned items including the implementation of training and procedures to support mitigation of an SBO event. This satisfies RG 1.155, Positions C.2 and C.3.4. Based on the above, the NRC staff finds this item resolved.

8.1.5 Post Combined License Activities

There are no post-COL activities related to this section.

8.1.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the introduction to the electric power systems, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff has compared the additional COL-specific supplemental information in the application to the relevant NRC regulations; guidance in NUREG-0800, Section 8.1, and other NRC regulatory guides and concludes that the applicant is in compliance with the NRC regulations. The staff based its conclusion on the following:

- VCS SUP 8.1-1, the applicant provided sufficient information regarding VCSNS's connections to various transmission systems in accordance with the recommendations of RG 1.206.

- VCS SUP 8.1-2, COL-specific regulatory guidelines and industry standards and additional new regulatory guidelines, are adequately addressed by the applicant. In conclusion, the applicant has provided sufficient information for satisfying the requirements of 10 CFR 50.63 and the guidance in RG 1.155.

8.2 Offsite Power System

8.2.1 Introduction

The offsite power system is referred to in RGs and industry standards as the "preferred power system." It includes two or more physically independent circuits capable of operating independently of the onsite standby power sources and encompasses the grid, transmission lines (overhead or underground), transmission line towers, transformers and other switchyard components.

The AP1000 design includes an exemption, in 10 CFR Part 52, "Licenses, certifications, and approvals for nuclear power plants," Appendix D, "Design Certification Rule for the AP1000 Design," paragraph V.B.3, to the requirement of General Design Criterion (GDC) 17, "Electric Power Systems," to have only one (not two) physically independent offsite circuit to provide for safety-related passive systems for core cooling and containment integrity. Therefore, for VCSNS Units 2 and 3, the single offsite power source provided from the transmission network is reviewed below to assure that it satisfies the requirements of GDC 17 with respect to its capacity and capability.

8.2.2 Summary of Application

Section 8.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 8.2 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 8.2, the applicant provided the following:

AP1000 COL Information Items

- VCS COL 8.2-1

The applicant provided additional information in VCS COL 8.2-1 to address COL Information Item 8.2-1 (COL Action Items 8.2.3-1 and 8.2.3.3-1) to address the design of the ac power transmission system and its testing and inspection plan. The information describes: 1) the designs of the plant site 230kV switchyard, and the twelve 230kV transmission lines connecting the plant switchyard to the SCE&G, the Santee Cooper and the Duke Energy transmission systems; 2) the connections of the generator step-up (GSU) transformers and the reserve auxiliary transformers (RATs) to the switchyard; 3) the designs of the switchyard circuit breakers and disconnect switches; 4) the transformer area arrangement for each unit; 5) the designs of the GSU transformers, unit auxiliary transformers (UATs), and RATs; 6) the design of the control building in the plant site 230kV switchyard; 7) the administrative control of 230kv switchyard and transmission lines circuit breakers, and 8) the switchyard and transmission lines testing and inspection plan, and 9) voltage operating range, frequency decay rate, and preservation of grid connection. VCS COL 8.2-1 is addressed in FSAR Sections 8.2.1, 8.2.1.1, 8.2.1.2, 8.2.1.3, 8.2.1.4, and 8.2.5.

- VCS COL 8.2-2

The applicant provided additional information in VCS COL 8.2-2 to address COL Information Item 8.2-2 (COL Action Items 8.2.3.1-1, 8.2.3.1-2, and 8.2.3.1-3), describing: 1) the switchyards arrangement and design of the protective relaying scheme; and 2) a transmission system study performed regularly to verify grid stability, switchyard voltage, and frequency to confirm the

transmission system capability to maintain reactor coolant pump (RCP) operation for three seconds following a turbine trip as specified in AP1000 DCD Section 8.2.2.

Site-Specific Information Replacing Conceptual Design Information (CDI)

- VCS CDI

The applicant provided site-specific information describing the transformer area located next to each unit's turbine building and containing the GSU transformer, the UATs, and the RATs. This replaced the CDI located in the AP1000 DCD.

Supplemental Information

- VCS SUP 8.2-1

The applicant provided supplemental information describing details of a failure mode and effects analysis (FMEA) performed for the offsite power distribution system, and plant site switchyard.

- VCS SUP 8.2-2

The applicant provided supplemental information describing the formal agreement between VCSNS and its TSO, SCE&G, which sets the requirements for transmission system studies and analyses.

- VCS SUP 8.2-3

The applicant provided supplemental information describing SCE&G's responsibility for maintaining area bulk transmission system reliability and demonstrating, by power system simulation studies, projections, and analyses, the current and future reliability of the system. The applicant provided information on conducting planning studies on an ongoing basis, including information on updating the studies to assess future system performance.

- VCS SUP 8.2-4

The applicant provided supplemental information describing the interconnection agreement between VCSNS and SCE&G demonstrating that protocols are in place for VCSNS to remain cognizant of grid vulnerabilities in order to make informed decisions regarding maintenance activities critical to the electric system. It also discusses the monitoring activities of the TSO in the form of real-time and offline studies to assess system conditions.

Interface Requirements

The plant interfaces for the standard design of the AP1000 are discussed in AP1000 DCD Tier 2, Section 8.2.5, and in Items 8.1, 8.2, and 8.3 of AP1000 DCD Tier 2, Table 1.8-1, where they are identified as "non-nuclear safety (NNS)" interfaces.

8.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the offsite power system are given in Sections 8.1 and 8.2 of NUREG-0800.

The regulatory bases for acceptance of the COL information and supplementary information items are established in:

- For VCS COL 8.2-1 and VCS SUP 8.2-1, the requirements of 10 CFR Part 50, "Domestic licensing of production and utilization facilities," Appendix A, "General Design Criteria for Nuclear Power Plants"; GDC 17; GDC 18, "Inspection and Testing of Electrical Power Systems"; and the guidelines of RG 1.206.

- For VCS COL 8.2-2, VCS SUP 8.2-2, and VCS SUP 8.2-3, the requirements of GDC 17 and the guidelines of RG 1.206.

- For VCS SUP 8.2-4, the requirements of GDC 17; GDC 18; and 10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants"; the guidelines of Generic Letter (GL) 2006-2, "Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power," and RG 1.206.

- For VCS CDI, the requirements of GDC 17.

8.2.4 Technical Evaluation

The NRC staff reviewed Section 8.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the offsite power system. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (Vogtle Electric Generating Plant [VEGP] Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Any confirmatory items in the standard content material retain the numbers assigned in the VEGP SER. Confirmatory items that are first identified in this SER section have a VCSNS designation (e.g., Confirmatory Item VCSNS 8.2-1).

The staff reviewed the information in the VCSNS COL FSAR:

AP1000 COL Information Item

- VCS COL 8.2-1

The applicant provided additional information in VCS COL 8.2-1 to resolve COL Information Item 8.2-1, which states:

> Combined License applicants referencing the AP1000 certified design will address the design of the ac power transmission system and its testing and inspection plan (DCD Section 8.2.5).

The commitment was also captured as COL Action Items 8.2.3-1 and 8.2.3.3-1 in Appendix F of NUREG-1793, which states:

> The operating voltage for the high side of the AP1000 transformer and transmission switchyard, as well as the frequency decay rate are site specific and, therefore, will be addressed in the COL application. The COL applicant will provide analysis of these matters, including transient stability, voltage operating range, and preservation of the grid connections, in the COL application (COL Action Item 8.2.3-1).
>
> Combined License applicants referencing the AP1000 certified design will address the design of the ac power transmission system and its testing and inspection plan (COL Action Item 8.2.3.3-1).

The NRC staff reviewed the resolution to COL information item, VCS COL 8.2-1, related to the transmission system design, testing, and inspection addressed in Section 8.2 of the VCSNS COL FSAR. The NRC staff's evaluation is described below.

The VCSNS Units 2 and 3 switchyard is tied to the SCE&G, Santee Cooper, and Duke Energy 230kV transmission systems. There are 12 overhead transmission lines connecting the new 230kV switchyard to other substations. (Eight lines, including three new lines and five re-terminated lines, are required for Unit 2 and four additional lines are required for Unit 3. These include the 230kV lines that originate at Units 2 and 3, as well as three tie lines to VCSNS Unit 1.) Each line connected to the switchyard has the capacity to feed the design house loads for both units under all design conditions without relying on the other unit's generator. Three of these lines are short tie-lines, running in an easterly direction, connecting to

the Unit 1 switchyard. (Two lines are required for Unit 2 and the third line is required for Unit 3.) Each is approximately one mile long with a thermal rating of 950 megavolt ampere (MVA). The remaining nine 230kV lines originate at the Units 2 and 3, switchyard and connect to various substations. The layout of transmission lines to the new and existing substations minimizes the crossing of transmission lines to the extent possible. All structures for these transmission lines are designed to meet the National Electrical Safety Code clearance requirements and SCE&G and Santee Cooper engineering standards. Each phase is designed using a conductor bundle comprised of two aluminum conductor, steel reinforced conductors. All structures are grounded with either ground rods or a counterpoise system and have provisions for two overhead ground wires. The NRC staff has reviewed the layout of transmission lines to the new and existing substations and concludes that at least one offsite power source will be available to both Units 2 and 3. The above satisfies the requirements of GDC 17 as it applies to AP1000 design.

With regard to the maintenance and testing of the offsite power circuits, in RAI 8.2-8, the staff asked the applicant to clarify the extent of the word “observes” and to clarify if VCSNS would follow NERC reliability standards.

In a letter dated February 17, 2009, the applicant stated that this statement was intended to indicate that SCE&G follows the applicable NERC Reliability Standards associated with switchyard maintenance and testing. The applicant stated that it will revise the FSAR as follows, for purposes of clarity:

> For performance of maintenance, testing, calibration, and inspection, TSO follows its own field test manuals, vendor manuals and drawings, and industry's maintenance practices to comply with NERC reliability standards.

The NRC staff has verified that VCSNS has updated the FSAR to include the above-mentioned revised paragraph. The NRC staff concludes that since the applicant will follow the NERC standard for switchyard maintenance and testing, this information satisfies the requirements of GDC 18 related to testing and is acceptable and therefore, the staff finds this item resolved.

Additionally, the applicant provided the site-specific voltage and frequency variations expected at the VCSNS Units 2 and 3 switchyard during transient and steady state operating conditions and the site-specific frequency decay rate to satisfy VCS COL 8.2-1.

- VCS COL 8.2-2

The applicant provided additional information in VCS COL 8.2-2 to resolve COL Information Item 8.2-2, which states:

> The Combined License applicant will address the technical interfaces listed in Table 1.8-1 and Section 8.2.2. These technical interfaces include those for ac power requirements from offsite and the analysis of the offsite transmission system and the setting of protective devices.

The NRC staff’s evaluation of the technical interfaces is addressed under “Interface Requirements” in this section of the safety evaluation report (SER).

The commitment was also captured as COL Action Items 8.2.3.1-1, 8.2.3.1-2, and 8.2.3.1-3 in Appendix F of NUREG-1793, which states:

> The COL applicant will perform a site-specific grid stability analysis to show that, with no electrical system failures, the grid will remain stable and the reactor coolant pump bus voltage will remain above the voltage necessary to maintain the flow assumed in the Chapter 15 analyses for a minimum of 3 seconds following a turbine trip (COL Action Items 8.2.3.1-1 and 8.2.3.1-3).
>
> The COL applicant will set the protective devices controlling the switchyard breakers in such a way as to preserve the grid connection following a turbine trip (COL Action Item 8.2.3.1-2).

The NRC staff reviewed the resolution to COL information item, VCS COL 8.2-2, related to the transmission system stability analysis and switchyard circuit breaker protective device settings included under Section 8.2 of the VCSNS COL FSAR. The NRC staff's evaluation follows.

VCS COL 8.2-2 was provided by the applicant describing details of: 1) the switchyards arrangement and design of the protective relaying scheme; and 2) a transmission system study performed regularly to verify grid stability, switchyard voltage, and frequency to confirm the transmission system capability to maintain RCP operation for three seconds following a turbine trip as specified in AP1000 DCD Section 8.2.2. VCS COL 8.2-2 is addressed in VCSNS COL FSAR Sections 8.2.1.2.2 and 8.2.2.

The switchyards are designed to provide high speed fault clearing while also maintaining high reliability and operational flexibility. The protective devices controlling the switchyard breakers are set with consideration given to preserving the plant grid connection following a turbine trip.

Under normal operating conditions, all 230kV breakers and disconnect switches are closed. The protective relay schemes are designed to provide redundancy such that adequate protection is provided given a failure of any single component of the system. Primary protective relays are supplied with current transformer inputs, potential transformer inputs, and direct current (dc) supplies that are independent of the same inputs to backup relays. The primary and backup relays trip 230kV circuit breakers via two independent trip coils supplied from two separate dc sources. All 230kV circuit breakers are provided with a breaker failure scheme to rapidly clear faults due to a failed breaker. Each 230kV transmission line is protected by two independent high-speed relaying schemes, each scheme using a different type of protection. The short 230kV tie-lines to Unit 1 and the tie-lines to the GSU and RAT circuit breakers also use two independent high-speed protection schemes, but each scheme may be of the same or similar type.

The staff determined that additional information was needed to conclude the technical evaluation of this item. In RAI 8.2-6, the staff asked the applicant to provide voltage variations in the switchyard and to describe the effect of voltage variations on the onsite auxiliary power system equipment and Class 1E battery chargers and regulating transformers. In a letter dated February 17, 2009, the applicant provided the assumptions taken into consideration for the studies performed, which are:

> The studies for the turbine trip event were conservatively performed to account for worst case voltage conditions by establishing the following initial conditions:
>
> – Studies were modeled using peak summer case loads.
>
> – Studies assumed the transmission line whose outage produced the most reactive output for the AP1000 unit was placed out of service. For Unit 2 studies, this line is the Santee Cooper Newberry line and for Unit 3 studies the line is the Denny Terrace line.
>
> – Studies assumed that the system generator, which produced the most reactive output for the AP1000 unit was placed out of service. For Unit 2 studies, this generator is VCSNS Unit 1 and for Unit 3 studies the generator is VCSNS Unit 2.
>
> During the three seconds following a turbine trip, only a small order of voltage fluctuation of approximately 0.01 per unit is seen, and this would not be expected to vary based on initial voltage.
>
> The grid voltage study of VCSNS Units 2 and 3 offsite power system confirms that offsite power system voltage remains within the normal operating limits of the AP1000 (0.95-1.05 per unit as defined by the AP1000 DCD) for three seconds following a turbine trip. Since there is no anticipated over or under-voltage condition following a turbine trip event, there are no anticipated effects from the event on the Class 1E battery chargers and regulating transformers.

Based on the above, the staff concludes that the switchyard breaker arrangements, the protection of lines by two independent protection schemes, and the breaker failure scheme would preserve the VCSNS's connection to the grid to satisfy the requirements of GDC 17. This satisfies COL Action Item 8.2.3.1-2.

With regard to the transmission system stability analysis, the applicant stated that the VCS grid stability analysis confirms that the grid will remain stable and the reactor coolant pump bus voltage will remain above the voltage necessary to maintain the flow assumed in the Chapter 15 analyses for a minimum of 3 seconds following a turbine trip as specified in DCD Section 8.2.2 (COL Action Item 8.2.3.1-3). The staff determined that additional information was needed to conclude the technical evaluation of this item. In RAI 8.2-1, the staff asked the applicant to confirm that the single offsite power circuit complied with the requirements of GDC 17 to provide voltage and frequency variations at all switchyards. The applicant was also asked to confirm that these voltage and frequency limits are acceptable for auxiliary power system equipment operation and Class 1E battery chargers during different operating conditions. The confirmation should include the following calculations: load flow analysis (bus and load terminal voltages of the station auxiliary system); short circuit analysis; equipment sizing studies; protective relay

setting and coordination; and motor starting with minimum and maximum grid voltage conditions. A separate set of calculations should be performed for each available connection to an offsite power supply. In addition, the applicant was asked to discuss how the results of the calculations will be verified before fuel loading.

In a letter dated February 17, 2009, the applicant stated that:

> The grid stability analysis confirms that the VCSNS Units 2 and 3 switchyard voltage remains between 0.95-1.05 per unit and that frequency remains between 60.5 Hertz (Hz) and 59.5 Hz for normal steady state operation, normal shutdown, unit start-up and for at least three seconds following a turbine trip event. Motor starting, utilizing the single largest motor, which is a main feedwater pump, with minimum and maximum grid voltage conditions, has been analyzed and found to have a negligible effect on the offsite system voltage. These ranges of voltage and frequency are considered normal and acceptable ranges for the AP1000, and are acceptable for the auxiliary power system equipment operation and Class 1E battery chargers.
>
> As part of the Federal Energy Regulatory Commission (FERC) large generator interconnection procedure, the transmission provider is required to perform a series of studies to identify the feasibility, impact and required system upgrades to support the addition of a large generator (> 20 megawatt [MW]) to the transmission system. The studies that were performed for VCSNS Units 2 and 3 include the Interconnection Feasibility Study, the Interconnection System Impact Study and the Interconnection Facilities Study. These studies include system power flow analysis, short circuit analysis and stability analysis to identify any required system upgrades or new equipment to support the added generation. Each of the Unit 2 studies were an input for the applicable Unit 3 study as each generator represents a separate and independent connection to the grid. These studies have been performed in accordance with the FERC and SCE&G transmission planning procedures, and are the basis for the required offsite power system facilities, including the VCSNS Units 2 and 3, switchyard to support the reliable connection of VCSNS Units 2 and 3 to the transmission system.

In addition, the applicant stated that the above grid voltage evaluation results will be verified during the preoperational testing identified in AP1000 DCD Section 14.2.10, which includes the following tests:

- 100 Percent Load Rejection (AP1000 DCD Section 14.2.10.4.21)
- Plant Trip from 100% Power (AP1000 DCD Section 14.2.10.4.24)
- Loss of Offsite Power (AP1000 DCD Section 14.2.10.4.26)

The NRC staff has reviewed the above information and concludes that this information is sufficient to demonstrate that the grid will remain stable to maintain RCP operation for 3 seconds following a turbine trip. The NRC staff finds that the applicant has satisfied the portion of COL Information Item 8.2-2 to maintain the voltage at the RCP to ≥ 80 percent for at least 3 seconds following a turbine trip, to maintain the reactor coolant flow assumed in the Chapter 15 analyses.

In a public meeting with the Nustart Consortium on April 7, 2009, there was an agreement that portions of BLN RAI 8.2-3 (VCS 8.2-1) were not within the scope of the BLN COL but rather within the scope of the AP1000 DC. This is considered a standard item applicable to all COL applications including VCSNS. Therefore, the staff finds that the relevant portions of RAI 8.2-1 are resolved for VCSNS.

In RAI 8.2-2, the staff asked the applicant to provide a discussion as to how single offsite power circuits complied with GDC 5, "Sharing of Structures, Systems, and Components"; GDC 17; and GDC 18, as well as with guidance in NUREG-0800 Section 8.2.II, and how SCE&G intends to meet the requirements of 10 CFR 50.65.

In a letter dated February 17, 2009, the applicant stated that in AP1000 DCD Section 8.1.4, the single offsite circuit does not perform a safety-related function for the AP1000 and that the required offsite circuit interface with the safety-related batteries is through the Class 1E battery chargers.

With regard to GDC 5, VCSNS provided the following information.

> VCSNS Units 2 and 3 will share a common switchyard. GSU connections for Units 2 and 3 are connected to the switchyard in a double bus/double breaker configuration. The remaining connections to the switchyard are connected in a breaker-and-a-half configuration. The grid stability study and the switchyard failures analysis show that this is a highly robust and reliable offsite power system. Events such as line faults, loss of system generating units, loss of largest system load, and turbine trip of Units 2 or 3 have been analyzed and shown to not affect the ability of the offsite power system to reliably provide sufficient power for house loads to each AP1000 unit during normal and abnormal conditions. The switchyard is not shared with any additional generating units beyond Units 2 and 3.

Based on the above, the NRC staff concludes that since Units 2 and 3 UATs and RATs are not shared among the units and the capacity of the offsite power system is large compared to the minimal safety-related loads powered by the offsite power (battery chargers and uninterruptible power supply (UPS)), the VCSNS Units 2 and 3 offsite power system design meets the requirements of GDC 5 and therefore this item is resolved.

With respect to GDC 17, the NRC staff finds that the results of the grid stability analysis demonstrate the offsite source capacity and capability to power plant components during normal, shutdown, startup, and turbine trip conditions. The results of the failure modes and effects analysis demonstrate the reliability of the offsite source, which minimizes the likelihood of its failure under normal, abnormal and accident conditions. Therefore, the NRC staff concludes that the VCSNS Units 2 and 3 offsite power systems design meets the requirements of GDC 17, as it is applicable to AP1000 design; therefore, this item is resolved.

With regard to GDC 18, NUREG-1793, Section 8.2.3.2 identifies COL Action Item 8.2.3.3-1 to demonstrate that the testing and inspection capability of the offsite power system be in conformance with GDC 18; therefore, this interface item must also be satisfied by the applicant.

In a letter dated January 20, 2010, the applicant endorsed the standard content answer provided in BLN RAI 8.2-10. The staff has verified that VCSNS COL FSAR Section 8.3.1.4 has been revised to include implementation of procedures for periodic verification of proper

operation of the onsite ac power system capability for automatic and manual transfer from the preferred power supply to the maintenance power supply and return from the maintenance power supply to the preferred power supply. The above satisfies the requirements of GDC 18 and is, therefore, acceptable.

With regard to 10 CFR 50.65, in a letter dated January 20, 2010, the applicant endorsed the standard content answer provided in BLN RAI 8.2-10. The standard content answer to BLN RAI 8.2-10 stated that COL FSAR Section 17.6 describes implementation of the requirements of 10 CFR 50.65. As indicated therein, implementation of the Nuclear Energy Institute (NEI) 07-02A, "Generic FSAR Template Guidance for Maintenance Rule Program Description for Plants Licensed Under 10 CFR Part 52," program description will determine the applicability of the maintenance requirements for the offsite power circuit. NEI 07-02A provides a template for presenting this information that has also been endorsed by the staff in a letter to NEI, dated January 24, 2008. The NRC staff verified that the reference to this topical report is in VCSNS COL FSAR Table 1.6-201. Since the scope of structures, systems, and components (SSCs) covered by the maintenance rule program is determined using the scoping procedures defined in the maintenance rule program description in accordance with NEI 07-02A, the offsite power system and its components will be evaluated for inclusion into the maintenance rule program in accordance with these scoping procedures during program implementation. The NRC staff notes that NEI 07-02A, Section 17.X.1.5, "Risk assessment and risk management per 10 CFR 50.65(a)(4)," addresses risk assessment and risk management from maintenance activities in accordance with 10 CFR 50.65(a)(4), and includes consideration of the issues associated with grid/offsite power system reliability as identified in NRC GL 2006-02, Items 5 and 6. Therefore, although detailed maintenance risk assessment is not anticipated in advance of the schedule defined in Table 13.4-201 of the VCSNS COL FSAR, performance of "grid-risk-sensitive" maintenance activities is a necessary consideration of the program in accordance with NEI 07-02A guidance. Based on the above, the NRC staff finds this item resolved.

In RAI 8.2-7, the staff asked the applicant if its grid stability analysis includes 1) the worst case disturbances; 2) station auxiliary loads for all three units and; 3) how often this study is performed. In a letter dated February 17, 2009, the applicant provided the following information:

> The analysis included the worst-case disturbances for which the grid has been analyzed to remain stable. The worst case disturbance for which the grid has been previously analyzed and considered stable is a three phase fault at the VCSNS switchyard (Unit 1) Bus #1 with the eight Fairfield Pumped Storage units in generating mode. The fault results in a loss of generation of VCSNS Unit 1 and the eight Fairfield units for a total loss of generation of 1584 MW following the clearing of the three phase fault. Following the clearing of the faults and loss of VCSNS Unit 1 and the Fairfield generating units, grid voltage recovers to prefault levels.
>
> Simulations included station auxiliary loads for VCSNS Units 2 and 3. The VCSNS Units' 2 and 3 switchyard is physically separated and independent from the VCSNS Unit 1 switchyard. VCSNS Unit 1 was included in the system model as a generator connected to the system, as was other system generation, but results of this study were specifically analyzed for impacts to the VCSNS Units 2 and 3 switchyard and generating units.

> Currently, transient stability studies are performed on a 3 year basis for VCSNS Unit 1 FSAR updates. These studies include the loss, as a result of a single event, of the largest generation capacity being supplied to the grid, removal of the largest load from the grid, or loss of the most critical transmission line. Also, SCE&G Transmission Planning performs power flow and transient stability studies annually in compliance with NERC Reliability Standards for both 1-5 year and 6-10 year planning horizons.

Based on the above, the NRC staff concludes that SCE&G's analysis demonstrates that the worst case disturbance for which the grid had been previously analyzed and considered stable is a three phase fault at the VCSNS switchyard and that following the clearing of the fault the grid voltage recovers to pre-fault levels; therefore, the issues in RAI 8.2-7 are resolved. The above, satisfies COL Action Items 8.2.3.1-1 and 8.2.3.1-3.

With regard to historical data regarding grid stability, the applicant provided the following information:

> From 1987 to 2007, the 230 kV transmission lines connecting the VCSNS site experienced 113 forced outages. The average frequency of forced line outages since 1987 is approximately 6 per year for the involved lines, with the majority being momentary outages due to lightning strikes or storm damage. The leading causes of forced outages of significant duration are equipment failures, logging and construction activities, and lightning or storm damage.

The NRC staff finds that the information regarding historical data on grid stability satisfies RG 1.206 and is acceptable.

Based on the above, VCSNS COL Information Item 8.2-2 is satisfied.

The following portion of this technical evaluation section is reproduced from Section 8.2.4 of the VEGP SER:

> <u>*Submerged/Inaccessible Electrical Cables*</u>
>
> *In RAI 8.2-14, the staff asked the applicant to describe the inspection, testing and monitoring program to detect degradation of inaccessible or underground control and power cables that support equipment and other systems that are within the scope of 10 CFR 50.65. The description should include the frequency of testing and inspection. Guidance on the selection of electric cable condition monitoring can be found in Sections 3 and 4.5 of NUREG/CR-7000, "Essential Elements of an Electric Cable Condition Monitoring Program."*
>
> *In a letter dated May 6, 2010, the applicant stated that the Maintenance Rule (MR) program will not be implemented until prior to fuel load; as such, specific information necessary to determine appropriate inspections, tests and monitoring is not available at this time. In order to determine the method and frequency, a review of detailed design and procurement information is needed. The applicant also stated that the latest industry experience and other available information, including NUREG/CR-7000, will be followed in developing a cable condition monitoring program as part of the MR program. The applicant also committed to revise its FSAR to include condition monitoring of underground or inaccessible*

cables in its MR program. The commitment will be reflected in the COL application Part 2, FSAR Chapter 17, Section 17.6 as shown below.

> *Condition monitoring of underground or inaccessible cables is incorporated into the maintenance rule program. The cable condition monitoring program incorporates lessons learned from industry operating experience, addresses regulatory guidance, and utilizes information from detailed design and procurement documents to determine the appropriate inspections, tests and monitoring criteria for underground and inaccessible cables within the scope of the maintenance rule (i.e., 10 CFR 50.65). The program takes into consideration Generic Letter 2007-01.*

Based on the above, the staff concludes that the applicant's condition monitoring program for underground or inaccessible cables satisfies the recommendations of GL 2007-01, "Inaccessible or Underground Power Cable Failures that Disable Accident Mitigation Systems or Cause Plant Transients," and the guidance in NUREG/CR-7000 and NUREG-0800 Section 8.2.III.1.L. Therefore, this item is resolved subject to the verification that the VEGP COL FSAR has been updated to include applicable portions of the RAI response. This is identified as ***Confirmatory Item 8.2-3.***

Resolution of Standard Content Confirmatory Item 8.2-3

Confirmatory Item 8.2-3 is an applicant commitment to revise its FSAR Section 17.6 to address condition monitoring of underground or inaccessible cables. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 8.2-3 is now closed.

Supplemental Information

- VCS SUP 8.2-1

VCS SUP 8.2-1 was provided by the applicant describing details of a FMEA performed for the offsite power distribution system, and plant site switchyard. VCS SUP 8.2-1 is addressed in VCSNS COL FSAR Section 8.2.1.1. The staff determined that additional information was needed to conclude the technical evaluation of this item. In RAI 8.2-4, the staff asked the applicant to discuss in detail the results of the FMEA. In a letter dated February 17, 2009, the applicant provided a more detailed description of the switchyard analysis including a change in its switchyard design. The NRC staff has reviewed this information and concludes that no offsite power contingencies, including a breaker not operating during a fault on an offsite line, fault on a switchyard bus, a spurious relay trip, or a loss of control power, result in a loss of both the preferred and maintenance sources of offsite power or cause a reactor trip. The staff also verified that VCSNS COL FSAR Sections 8.2.1 and 8.2.1.1 and Figure 8.2-202 have been updated to reflect the change to the switchyard design. This issue has been adequately addressed and is resolved.

- VCS SUP 8.2-2, VCS SUP 8.2-3, and VCS SUP 8.2-4

With regard to VCS SUP 8.2-2, the applicant provided the following information:

> The SCE&G transmission system operator (TSO) is responsible for the safe and reliable operation of the electrical transmission system. TSO and the Operations Departments for the VCSNS nuclear plants have formal agreements and protocols to provide safe and reliable operation of the transmission system and equipment at the nuclear plants in accordance with North American Electric Reliability Corporation (NERC) Standard NUC-001-01. Elements of this agreement are implemented in accordance with the procedures of both parties. TSO continuously monitors and evaluates grid reliability and switchyard voltages, and informs the nuclear plant operators of any grid instability or voltage inadequacies. They also work to maintain local voltage requirements as required by the nuclear plant. The nuclear plant operators review the transmission system parameters and inform TSO immediately prior to initiating any plant activities that may affect grid reliability. In addition, the nuclear plant operators inform TSO of changes in generation ramp rates and notify them of any developing problems that may impact generation.

The NRC staff has reviewed the information provided by the applicant and concludes that the information provided by the applicant is consistent with the recommendations of RG 1.206 and is, therefore, acceptable.

With regard to VCS SUP 8.2-3, the applicant provided the following information:

> As set forth in NERC Reliability Standard NUC-001-1, the formal agreement between Nuclear Plant Generator Operators (described here as VCSNS Operations Department) and Transmission Entities (described here as SCE&G TSO) establishes the Nuclear Plant Interface Requirements, such as transmission system studies and analyses. TSO performs short-term grid analyses to support VCSNS plant startup and normal shutdown. Long-term grid studies, done at a minimum of every 36 months, are performed and coordinated with the VCSNS Operations Departments. Studies of future load growth and new generation additions are performed yearly in accordance with NERC and Virginia-Carolinas Reliability Council standards.
>
> New large generating units requesting to connect to the area bulk electric system are required to complete the Large Generator Interconnection Procedure. The studies performed by TSO as part of this procedure examine the generating unit (combined turbine-generator-exciter) and the main step-up transformer(s).

The staff concludes that the supplemental information provided by the applicant is consistent with the recommendations of RG 1.206 and acceptable.

With regard to VCS SUP 8.2-4, the applicant provided the following information:

> The agreement between TSO and the VCS Operations Departments demonstrates protocols in place for the plant to remain cognizant of grid vulnerabilities to make informed decisions regarding maintenance activities critical to the electrical system. In the operations horizon, the TSO continuously monitors real-time power flows and assesses contingency impacts through use of a state estimator tool. Operational planning studies are also performed using offline power flow study tools to assess near-term operating conditions under varying load, generation, and transmission topology patterns.

The staff determined that additional information was needed to conclude the technical evaluation of this item. In RAI 8.2-5, the staff asked the applicant to explain how notifications regarding changes in grid conditions are coordinated between the system operator and the operators of existing VCSNS Unit 1, and the proposed Units 2 and 3, and to explain if the interface agreement requires that the operators be notified of periods when the system operator is unable to determine if offsite power voltage and capacity is inadequate. In a letter dated February 17, 2009, the applicant provided the following information:

> Although the VCSNS generators connect to the SCE&G transmission system, the Unit 2 and 3 generators do not share a common switchyard with the existing VCSNS Unit 1. The VCSNS Unit 2 and 3 switchyard is connected to the offsite power system and VCSNS Unit 1 switchyard by transmission lines as described in FSAR Subsection 8.2.1. Per the interface agreement, it is the responsibility of the System Controllers (SCE&G Transmission System Operator or TSO) to immediately report any present or predicted grid instability or voltage inadequacy to the VCSNS control room. Per the interface agreement, the control room is required to be notified of periods when the system operator is unable to determine if offsite power voltage and capacity is inadequate.

Based on its review, the NRC staff concludes that the applicant has demonstrated that protocols are in place for the VCSNS to remain cognizant of grid vulnerabilities in order to make informed decisions regarding maintenance activities critical to the electric system. This is consistent with the recommendations of RG 1.206 and GL 2006-2, of which one of the provisions is to reduce the likelihood of losing offsite power. Therefore, the staff finds this issue resolved.

Site-Specific Information Replacing Conceptual Design Information (CDI)

- VCS CDI

The CDI information provided by the applicant regarding the transformer area located next to each unit's turbine building is consistent with the AP1000 DCD and satisfies the applicable requirements of GDC 17.

Interface Requirements

The plant interfaces for the standard design of the AP1000 are discussed in AP1000 DCD Tier 2, Section 8.2.5, and in Items 8.1, 8.2, and 8.3 of AP1000 DCD Tier 2, Table 1.8-1, where they are identified as 'non-nuclear safety (NNS)' interfaces.

The applicant incorporated by reference Section 1.8 of the AP1000 DCD. This section of the AP1000 DCD identifies certain interfaces with the standard design that have to be addressed in accordance with 10 CFR 52.47(a)(1)(vii).[7] As required by 10 CFR 52.79(d)(2), the COL application must demonstrate how these interface items have been met.

In order to satisfy plant Interface Item 8.1 in AP1000 DCD Tier 2, Table 1.8-1, the applicant provided the design criteria, RGs, and IEEE standards in Section 8.1.4.3 of the VCSNS COL FSAR. The NRC staff finds the information to be consistent with Section 8.1 of NUREG-0800 and acceptable. Therefore, this interface item for offsite power system has been met.

[7] Following the update to 10 CFR Part 52 (72 *Federal Register* [FR] 49517), this provision has changed to 10 CFR 52.47(a)(25).

In order to satisfy plant Interface Item 8.2 in AP1000 DCD Tier 2 Table 1.8-1, the staff asked RAI 1-4. In response to this RAI, VCSNS provided the steady state load, inrush kVA for motors, nominal voltage, allowable voltage regulation, nominal frequency, allowable frequency fluctuation, maximum frequency decay rate, and limiting under frequency values for the RCP. The applicant committed to include this information in a revision to the VCSNS COL FSAR. This is **Confirmatory Item VCSNS 8.2-1**.

Resolution of Confirmatory Item VCSNS 8.2-1

Confirmatory Item 8.2-1 is an applicant commitment to revise its FSAR Section 8.2 to provide various parameters associated with the RCP. The staff verified that the VCSNS COL FSAR was appropriately revised with the addition of Table 8.2-201, "Grid Stability Interface Evaluation." As a result, Confirmatory Item 8.2-1 is now closed.

Regarding plant Interface Item 8.3 in AP1000 DCD Tier 2, Table 1.8-1, the applicant did not provide a statement affirming that "the protective devices controlling the switchyard breakers are set with consideration given to preserving the plant grid connection following a turbine trip." In RAI 8.2-9, the staff asked the applicant to provide a reference to where this issue is discussed in the VCSNS application, or to provide a proposed revision to the application to address the issue. In its response dated July 30, 2009, the applicant identified a proposed addition to VCSNS COL FSAR Section 8.2.1.2.2 that states "The protective devices controlling the switchyard breakers are set with consideration given to preserving the plant grid connection following a turbine trip." The NRC staff verified that the VCSNS COL FSAR was updated to include this change and concludes that the switchyard arrangement, the protection of lines by independent high speed relaying, and breaker failure would preserve the VCSNS connection to the grid following a turbine trip satisfying the requirements of GDC 17. Therefore, the staff finds this interface has been met.

The NRC staff has reviewed the information supplied by the applicant and concludes that the applicant has adequately addressed Interface Items 8.1, 8.2, and 8.3 of AP1000 DCD Tier 2, Table 1.8-1.

8.2.5 Post Combined License Activities

There are no post-COL activities related to this section.

8.2.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the offsite power system, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the requirements of GDC 17 and GDC 18. The staff based its conclusion on the following:

- VCS COL 8.2-1, the applicant provided sufficient information involving the design details of the plant site switchyard, its interface with the local transmission grid, protective device settings, and its testing and inspection plan in accordance with the guidelines of RG 1.206.

- VCS COL 8.2-2, the applicant provided sufficient information to demonstrate that the grid will remain stable to maintain RCP operation for three seconds following a turbine trip in accordance with the guidelines of RG 1.206.

- VCS CDI in Section 8.2.1 of the VCSNS COL FSAR, the applicant provided sufficient information concerning the transformer area located next to each unit's turbine building in accordance with the guidelines of RG 1.206.

- VCS SUP 8.2-1, the applicant provided sufficient information describing details of a failure analysis performed for the offsite power distribution system, and plant site switchyard in accordance with the guidelines of RG 1.206.

- VCS SUP 8.2-2, the applicant provided sufficient information to demonstrate that the risk, reliability, operating limits, and administrative control of the power transmission grid are in accordance with in accordance with the guidelines of RG 1.206 and GL 2006-2.

- VCS SUP 8.2-3, the applicant provided sufficient information to describe SCE&G's responsibility for maintaining area bulk transmission system reliability and demonstrating, by power system simulation studies, projections, and analyses, the current and future reliability of the system in accordance with the guidelines of RG 1.206, and GL 2006-2.

- VCS SUP 8.2-4, the applicant provided sufficient information to demonstrate that protocols are in place for VCSNS to remain cognizant of grid vulnerabilities in order to make informed decisions regarding maintenance activities critical to the electric system in accordance with in accordance with the guidelines of RG 1.206 and GL 2006-2.

- The applicant provided sufficient information regarding the interfaces for standard design from the generic AP1000 DCD Table 1.8-1, Items 8.1, 8.2, and 8.3.

8.2.A Site-Specific ITAAC for Offsite Power Systems

8.2.A.1 *Introduction*

This section specifically addresses the site-specific inspections, tests, analyses and acceptance criteria (SS-ITAAC), that the applicant proposed related to the offsite power system that are necessary and sufficient to provide reasonable assurance that the facility has been constructed and will operate in conformance with the COL, the provisions of the Atomic Energy Act, and NRC regulations.

8.2.A.2 *Summary of Application*

Section 14.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 14.3 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 14.3, the applicant provided the following:

Supplemental Information

- STD SUP 14.3-1

The applicant provided supplemental information related to the offsite power system in Standard (STD) SUP 14.3-1 in VCSNS COL FSAR Section 14.3.2.3.

8.2.A.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for ITAAC are given in Section 14.3 of NUREG-0800.

The applicable regulatory requirements for electrical SS-ITAAC are in 10 CFR 52.80(a), "Contents of applications; additional technical information."

8.2.A.4 *Technical Evaluation*

The NRC staff reviewed Section 14.3 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to SS-ITAAC for offsite power systems. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4, COL application.

The following portion of this technical evaluation section is reproduced from Section 8.2.A.4 of the VEGP SER:

Supplemental Information

- *STD SUP 14.3-1, addressing SS-ITAACs*

ITAAC Screening Summary Table 14.3-201 of the BLN FSAR identified the transmission switchyard and offsite power system as a site-specific system and selected them for ITAAC, but the table indicated "title only, no entry for COLA." Consequently, Section 2.6.12 of Part 10 of Appendix B, "License Conditions and ITTAC" of the BLN COL application (COLA) provided no ITAAC information for the transmission switchyard and offsite power system. The COL applicant must provide this site-specific ITAAC for compliance with 10 CFR 52.79(d) and 10 CFR 52.80(a). In RAI 14.3-1, the NRC staff stated that RG 1.206, CIII.7.2, Site-Specific ITAAC, recommends that applicants develop ITAAC for the site-specific systems that are designed to meet the significant interface requirements of the standard certified design, that is, the site-specific systems that are needed for operation of the plant (e.g., offsite power). Therefore, the applicant should justify why there is no ITAAC entry associated with offsite power, or revise Table 14.3-201 of the BNL FSAR to include ITAAC entries for the transmission switchyard and the offsite power system.

By letter dated June 24, 2008, the applicant stated that approved DCD Section 14.3 refers to the selection criteria and processes used for developing the AP1000 Certified Design Material (CDM) and identifies no interfaces (e.g., systems for storm drain, raw water, and closed circuit TV system, etc.) meeting this definition. Thus, according to the applicant, the CDM does not include ITAAC or a requirement for COL developed ITAAC for the offsite power interface system. The staff found the above response to be inconsistent with the requirements of 10 CFR 52.80(a), and guidance of NUREG-0800 Section 14.3 and RG 1.206.

Several discussions were held between the applicant and the NRC staff to discuss this issue. The staff pointed out that the offsite power system performs an important function in the passive designs as it provides power to the safety-related loads through battery chargers during normal, abnormal and accident conditions. It also provides power to those active systems that provide defense-in-depth capabilities for reactor coolant make-up and decay heat removal.

These active systems are the first line of defense to reduce challenges to the passive systems in the event of plant transients. The above function of the

offsite power system in passive designs supports the need for ITAAC for these systems so that the staff can verify that (1) the designed and installed systems, structures, or components of the offsite power systems will perform as designed and (2) the required single circuit from the transmission network satisfies the requirements of GDC 17.

Subsequently, in a letter dated May 11, 2009, the applicant revised its response to RAI 14.3-1 and provided an ITAAC for the offsite power system to verify that the as-built offsite portion of the power supply from the transmission network to the interface with the onsite ac power system will satisfy the applicable provisions of GDC 17. Specifically, the ITAAC shall verify:

(1) A minimum of one offsite circuit supplies electric power from the transmission network to the interface with the onsite portions of the ac power system.

(2) Each offsite circuit interfacing with the onsite ac power system is adequately rated to supply assumed loads during normal, abnormal and accident conditions.

(3) During steady state operation, each offsite circuit is capable of supplying required voltage to the interface with the onsite ac power system that will support operation of assumed loads during normal, abnormal and accident conditions.

(4) During steady state operation, each offsite circuit is capable of supplying required frequency to the interface with the onsite ac power system that will support operation of assumed loads during normal, abnormal and accident conditions.

(5) The fault current contribution of each offsite portion circuit is compatible with the interrupting capability of the onsite ac power system fault current interrupting devices.

(6) The reactor coolant pumps continue to receive power from either the main generator or the grid for a minimum of 3 seconds following a turbine trip.

To ensure that the requirements of GDC 17 for the adequacy of the offsite power source within the standard design scope are met, the proposed ITAAC would verify the capacity and capability of the offsite source to feed the onsite power system. The proposed ITAAC provides for the inspection of the connection of the offsite source to the onsite power system.

Additionally, the applicant identified all associated changes that will be made in a future revision of the Bellefonte FSAR. On the basis of its review, the staff finds that the applicant has adequately addressed the site-specific ITAAC for the offsite power system so that the staff can verify that the designed and installed systems, structures, or components of the offsite power system will perform as designed. Therefore, the staff concludes that the applicant meets the requirements of 10 CFR 52.79(d) and 10 CFR 52.80(a), and the guidance of

*SRP 14.3 and RG 1.206. The applicant will revise the BLN COL FSAR to include the proposed ITAAC for offsite power system. This is identified as **Confirmatory Item 8.2A-1**, pending NRC review and approval of the revised BLN COL FSAR.*

Resolution of Standard Content Confirmatory Item 8.2A-1

The applicant proposed a license condition in Part 10 of the VEGP COL application, which will incorporate the ITAAC identified in Appendix B. Appendix B includes ITAAC for the offsite power system. The license condition's proposed text is evaluated in Chapter 1 of this SER.

Confirmatory Item 8.2A-1 required the applicant to update its FSAR to include proposed ITAAC for the offsite power system. The NRC staff verified that the VEGP COL application was appropriately updated. The ITAAC associated with the offsite power system are shown in VEGP COL Part 10, Appendix B, Table 2.6.12-1. Table 8.2A-1 of this SER reflects this table. As a result, Confirmatory Item 8.2A-1 is resolved. Therefore, the staff will include the ITAAC for the offsite power system in the license.

8.2.A.5 *Post Combined License Activities*

For the reasons discussed in the technical evaluation section above, the staff finds the following ITAAC proposed by the applicant acceptable:

- The licensee shall perform and satisfy the ITAAC defined in Table 8.2A-1, "Offsite Power System."

8.2.A.6 *Conclusion*

The staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the requirements of GDC 17 and GDC 18.

8.3 Onsite Power Systems

8.3.1 AC Power Systems

8.3.1.1 *Introduction*

The onsite ac power system includes those standby power sources, distribution systems, and auxiliary supporting systems provided to supply power to safety-related equipment or equipment important to safety for all normal operating and accident conditions. In the AP1000 passive reactor design used at VCSNS, the onsite ac power system is a non-Class 1E system that provides reliable ac power to the various system electrical loads. It does not perform any safety-related functions. These loads enhance an orderly shutdown under emergency conditions when offsite power is not available. Additional loads for investment protection can be manually loaded on the standby power supplies. Diesel generator sets are used as the standby power source for the onsite ac power systems.

8.3.1.2 *Summary of Application*

Section 8.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 8.3 of the AP1000 DCD, Revision 19, Section 8.3 of the AP1000 DCD includes Section 8.3.1.

In addition, in VCSNS COL FSAR Section 8.3.1, the applicant provided the following:

AP1000 COL Information Items

- VCS COL 8.3-1

VCS COL 8.3-1 describes: 1) the grounding grid system design within the plant boundary; and 2) a lightning protection risk assessment for the buildings comprising VCSNS Units 2 and 3.

- STD COL 8.3-2

STD COL 8.3-2 describes the details of: 1) the bases of the recommendations in operation, inspection, and maintenance procedures for the onsite standby diesel generators; and 2) procedures for the periodic testing of penetration overcurrent protective devices.

Supplemental Information

- VCS SUP 8.3-1

VCS SUP 8.3-1 describes the site-specific switchyard and power transformer voltage.

- VCS SUP 8.3-2

VCS SUP 8.3-2 states that the site conditions provided in Table 2.0-201 and Section 2.3 of the VCSNS COL FSAR are bounded by the standard site conditions used to rate the diesel engine and the associated generator in AP1000 DCD Section 8.3.1.1.2.3.

- STD SUP 8.3-4

STD SUP 8.3-4 provides supplemental information regarding periodic verification of the onsite ac power system's capability to transfer between the preferred power supply and the maintenance power supply.

8.3.1.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the ac power systems are given in Section 8.3.1 of NUREG-0800.

The regulatory basis for acceptance of VCS COL 8.3-1, addressing the grounding and lightning protection systems are the guidelines of:

- RG 1.204, "Guidelines for Lightning Protection of Nuclear Power Plants"
- IEEE Standard 80, "Guide for Safety in AC Substation Grounding"
- IEEE Standard 665, "Guide for Generating Station Grounding"

The bases for acceptance of the part of STD COL 8.3-2 addressing the recommendations in operation, inspection, and maintenance procedures for the onsite standby diesel generators, are standards commonly used in the industry.

The regulatory bases for acceptance of the part of STD COL 8.3-2 addressing procedures for penetration protective device testing, are the guidelines of:

- RG 1.63, Revision 3, "Electric Penetration Assemblies in Containment Structures for Nuclear Power Plants"

8.3.1.4 *Technical Evaluation*

The NRC staff reviewed Section 8.3.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the ac power systems. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.
- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.
- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference

COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The staff reviewed the information in the VCSNS COL FSAR:

AP1000 COL Information Items

- VCS COL 8.3-1

The NRC staff reviewed VCS COL 8.3-1 related to COL Information Item 8.3-1. COL Information Item 8.3-1 states:

> Combined License applicants referencing the AP1000 certified design will address the design of grounding and lightning protection.

The commitment was also captured as COL Action Item 8.3.1.6-1 in Appendix F of NUREG-1793, which states:

> The COL applicant will provide the design of the site-specific grounding and lightning protection.

The NRC staff reviewed the resolution to COL information item, VCS COL 8.3-1, related to the ground grid system and lightning protection included under Section 8.3 of the VCSNS COL FSAR. The NRC staff's evaluation is described below.

The applicant states that a grounding grid system design within the plant boundary includes step and touch potentials near equipment that are within the acceptable limit for personnel safety. Actual resistivity measurements from soil samples taken at the plant site were analyzed to create a soil model. The ground grid conductor size was then determined using the methodology outlined in IEEE Standard 80 and a grid configuration for the site was created. The grid configuration was modeled in conjunction with the soil model. The resulting step and touch potentials are within the acceptable limits for personnel safety. Based on the above, the staff concludes that IEEE Standard 80 provides an acceptable method for determining the right size for ground conductors; therefore, the COL information item provided by the applicant on station grounding grid is acceptable.

With regard to lightning protection, the applicant stated that in accordance with IEEE Standard 665, a lightning protection risk assessment for the buildings was performed based on the methodology in National Fire Protection Association (NFPA) 780, "Standard for the Installation of Lightening Protection." The tolerable lightning frequency for each of the buildings was determined to be less than the expected lightning frequency; therefore, lightning protection is required for the VCSNS Units 2 and 3 based on the design in accordance with NFPA 780. The zone of protection is based on the elevations and geometry of the structures. It includes the space covered by a rolling sphere having a radius sufficient enough to cover the building to be protected. The zone of protection method is based on the use of ground masts, air terminals and shield wires. Either copper or aluminum is used for lightning protection. Lightning protection grounding is interconnected with the station or switchyard grounding system.

Based on the above, the staff concludes that IEEE Standard 665 and NFPA 780 provide an acceptable method for lightning protection; therefore, the supplemental information provided by the applicant on lightning protection is acceptable.

The following portion of this technical evaluation section is reproduced from Section 8.3.1.4 of the VEGP SER:

- *STD COL 8.3-2*

The NRC staff reviewed STD COL 8.3-2 related to COL Information Item 8.3-2. COL Information Item 8.3-2 states (in part):

> *The Combined License applicant will establish plant procedures as required for:*
>
> – *Periodic testing of penetration protective devices*
>
> – *Diesel generator operation, inspection and maintenance in accordance with manufacturers' recommendations*

The commitment was also captured as COL Action Items 8.3.1.2-1 and 8.4.1-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which state:

> *The COL applicant will establish plant procedures for preoperational testing to verify proper operation of the ac power system. (COL Action Item 8.3.1.2-1)*
>
> *The COL applicant will establish plant procedures for periodic testing of penetration protective devices. (COL Action Item 8.4.1-1)*

A part of standard information item, STD COL 8.3-2, was provided by the applicant describing the bases of the recommendations in operation, inspection, and maintenance procedures for the onsite standby diesel generators. This part of STD COL 8.3-2 is addressed in BLN COL FSAR Section 8.3.1.1.2.4.

A part of standard information item, STD COL 8.3-2, was provided by the applicant describing procedures for the testing of penetration protective devices. This portion of STD COL 8.3-2 is addressed in BLN COL FSAR Section 8.3.1.1.6.

The NRC staff reviewed the resolution to COL information item, STD COL 8.3-2, related to testing procedures for standby diesel generators and electrical penetrations included under Section 8.3 of the BLN COL FSAR. The NRC staff's evaluation follows.

For the operation, inspection and maintenance for diesel generators, the applicant's procedures will consider both the diesel generator manufacturer and industry diesel working group recommendations.

In RAI 8.3.1-2, the NRC staff stated that COL Action Item 8.3.1.2-1 in the NRC's FSER for the AP1000 DCD (NUREG-1793), contains the following discussion:

> *Preoperational tests are conducted to verify proper operation of the ac power system. The preoperational tests include operational testing of the diesel load sequencer and diesel generator capacity testing. The diesel generators are not safety-related and will be maintained in accordance with the requirements of the overall plant maintenance program. This program will cover the preventive, corrective, and predictive maintenance activities of the plant systems and equipment and will be presented in the COL application. This COL information is discussed in DCD Tier 2, Section 8.3.3, "Combined License Information for Onsite Electrical Power."*

In RAI 8.3.1-2, the applicant was asked to provide a reference to where the preoperational testing program and the preventive, corrective, and predictive maintenance activities for the diesel generators are discussed in the application, or provide a proposed revision to the application to address this issue.

In a letter dated April 6, 2009, the applicant stated that COL Action Item 8.3.1.2-1 in Appendix F of the FSER does not indicate that "pre-operational testing" of the diesel generators has been addressed in the DCD. Pre-operational testing of the ac power system is described in FSER Section 14, DCD Section 14, and BLN COL FSAR Chapter 14. Specifically, DCD Sections 14.2.9.2.15 and 14.2.9.2.17 address the onsite ac power system and diesel generator testing, including diesel generator capacity and sequencer tests. BLN COL FSAR Section 14.2.9.4.23 describes testing of the offsite power system. The NRC staff agrees that pre-operational testing of the diesel generators is addressed in DCD Section 14.2.9.2.17 and was found acceptable by the staff as indicated in FSER NUREG-1793 Section 14.2.9. Based on the above, the NRC staff finds that the applicant's response to the portion of the RAI regarding COL areas of responsibility is acceptable.

In addition, the applicant stated that BLN COL FSAR Section 8.3.1.1.2.4 will be revised to include inspection and maintenance (including preventive, corrective, and predictive maintenance) procedures considering both the diesel generator manufacturer's recommendations and industry diesel working group recommendations.

The NRC staff concludes that following the manufacturer and industry diesel generator working group recommendations for onsite standby diesel generator inspection and maintenance including preventive, corrective, and predictive maintenance provides reasonable assurance that the diesel generators will be adequately maintained. Therefore, DCD COL Information, Item 8.3-2 and FSER COL Action Item 8.3.1.2-1 are resolved subject to the verification that the BLN COL FSAR has been updated to include applicable portions of the RAI response. This is identified as ***Confirmatory Item 8.3.1-1****.*

With regard to establishing plant procedures for periodic testing of protective devices that provide penetration overcurrent protection, the applicant will

implement procedures to periodically test a sample of each different type of overcurrent device. Testing includes:

- *Verification of thermal and instantaneous trip characteristics of molded case circuit breakers*
- *Verification of long time, short time, and instantaneous trips of medium voltage air circuit breakers*
- *Verification of long time, short time, and instantaneous trips of low voltage air circuit breakers*

Because the above testing is consistent with the recommendation of RG 1.63, the NRC staff concludes that the above information satisfies COL Information Item 8.3-2 and FSER COL Action Item 8.3.1.6-1, and that these items are resolved.

Resolution of Standard Content Confirmatory Item 8.3.1-1

Confirmatory Item 8.3.1-1 required the applicant to update its FSAR to specify that onsite standby diesel generator inspection and maintenance (including preventive, corrective, and predictive maintenance) procedures will consider both the diesel generator manufacturer's recommendations and industry diesel working group recommendations. The NRC staff verified that the VEGP COL FSAR was appropriately updated. As a result, Confirmatory Item 8.3.1-1 is resolved.

Supplemental Information

- VCS SUP 8.3-1

The applicant provided information in VCS SUP 8.3-1 describing the site-specific switchyard and transformer voltage. The staff found this statement of fact acceptable; therefore, no evaluation is required.

- VCS SUP 8.3-2

The applicant stated in VCS SUP 8.3-2 that its site conditions provided in Section 2.3 were bounded by the standard site conditions in AP1000 DCD Section 8.3.1.1.2.3 used to rate the diesel engine and the associated generator. The staff agrees that the VCS site conditions are bounded by the standard site conditions used to determine the rating.

- STD SUP 8.3-4

For evaluation of the subject of this item, see the evaluation of VCS COL 8.2-2 regarding conformance to GDC 18.

8.3.1.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

8.3.1.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to onsite ac power systems, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff has compared the COL information items, the supplemental information, the interfaces for standard design, and the proposed design changes and corrections in the application to the relevant NRC regulations, guidance in NUREG-0800, Section 8.3.1, and other NRC regulatory guides and concludes that the applicant is in compliance with the NRC regulations. The staff based its conclusion on the following:

- VCS COL 8.3-1, the applicant provided sufficient information related to the grounding grid system design and lightning protection consistent with the recommendations of RGs 1.206 and 1.204.

- STD COL 8.3-2, the applicant provided sufficient information related to preoperational testing of the diesel generators and periodic testing of the penetration overcurrent protective devices consistent with industry standards and the recommendations of RG 1.63.

- VCS SUP 8.3-1, the applicant provided sufficient information related to the site-specific switchyard and power transformer voltage.

- VCS SUP 8.3-2, the applicant demonstrated its site-specific conditions are bounded by the standard site conditions in the AP1000 DCD for rating the diesel generator.

- STD SUP 8.3-4, the applicant will implement procedures for periodic verification of offsite power system capacity for automatic and manual transfer from the preferred power supply to maintenance power supply and vice-versa to satisfy the requirements of GDC 18.

8.3.2 DC Power Systems

8.3.2.1 *Introduction*

The direct current (dc) power systems include those dc power sources and their distribution systems provided to supply motive or control power to safety-related equipment. Batteries and battery chargers serve as the power sources for the dc power system and inverters convert dc from the dc distribution system to ac instrumentation and control power, as required. These three components, when combined, provide a UPS that furnishes a continuous, highly reliable source of ac supply.

The AP1000 dc power system is comprised of independent Class 1E and non-Class 1E dc power systems. Each system consists of ungrounded stationary batteries, dc distribution equipment, and UPS.

8.3.2.2 *Summary of Application*

Section 8.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 8.3 of the AP1000 DCD, Revision 19. Section 8.3 of the AP1000 DCD includes Section 8.3.2. The advanced safety evaluation (ASE) with confirmatory items for Section 8.3.2 was based on the VCSNS COL FSAR, Revision 2 and DCD Revision 17. After submitting DCD Revision 17 to the NRC, Westinghouse revised the COL Information Item (COL 8.3-2) and the applicant took a departure (STD DEP 8.3-1) to address the revised COL information item. This COL information item has been incorporated into Revision 18 of the DCD; however, the discussion of the COL information item below did not change.

In addition, in VCSNS COL FSAR Section 8.3.2, the applicant provided the following:

Tier 2 Departure

- STD DEP 8.3-1

In a letter dated October 20, 2010, the applicant endorsed a Southern Nuclear letter dated October 15, 2010, for the VEGP application that proposed the following Tier 2 standard departure related to a proposed revision to AP1000 DCD Section 8.3.2.2. In the October 15, 2010, Southern Nuclear letter, Southern stated that the Class 1E battery chargers are designed to limit the input (ac) current to an acceptable value under faulted conditions on the output side; however, the voltage regulating transformers do not have active components to limit current; therefore, the Class 1E voltage regulating transformer maximum current is determined by the impedance of the transformer. The voltage regulating transformer in combination with fuses and/or breakers will interrupt the input or output (ac) current under faulted conditions on the output side. Since AP1000 DCD Section 8.3.2.2 states that the Class 1E voltage regulating transformers are designed to limit the input (ac) current to an acceptable value under faulted conditions on the output side, the use of the breakers/fuses for the regulating transformers for isolation function, in lieu of current limiting characteristics as presented in the AP1000 DCD, is a departure for VEGP. Because the issue is identified as a standard item it is also a departure for VCSNS.

AP1000 COL Information Item

- STD COL 8.3-2

STD COL 8.3-2 describes the details of: 1) procedures for inspection, maintenance, and testing of Class 1E batteries; and 2) the clearing of ground faults on the Class 1E dc power system. In a letter dated October 20, 2010, the applicant endorsed a Southern Nuclear letter dated October 15, 2010, for the VEGP application that proposed to revise STD COL 8.3-2 by adding information related to periodic testing for the battery chargers and voltage regulating transformers.

Supplemental Information

- STD SUP 8.3-3

The applicant provided supplemental information stating that there are no site-specific non-Class 1E dc loads connected to the Class 1E dc system.

8.3.2.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the dc power systems are given in Section 8.3.2 of NUREG-0800.

The regulatory basis for acceptance of COL information item STD COL 8.3-2 and STD SUP 8.3-3 is established in:

- GDC 17
- GDC 18
- RG 1.206
- RG 1.129, Revision 2, "Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Nuclear Power Plants"
- IEEE Standard 450, "Recommended Practice for the Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications"
- RG 1.75, "Physical Independence of Electrical Systems," Revision 3

8.3.2.4 *Technical Evaluation*

The NRC staff reviewed Section 8.3.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the dc power systems. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3, COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4, COL application.

The following portion of this technical evaluation section is reproduced from Section 8.3.2.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 8.3-2, involving the inspection, maintenance, and testing of Class 1E batteries and clearing of ground faults on the Class 1E dc system.*

The NRC staff reviewed STD COL 8.3-2 related to COL Information Item 8.3-2. COL Information Item 8.3-2 states (in part):

> *The Combined License applicant will establish plant procedures as required for:*
>
> – *Clearing ground fault on the Class 1E dc system*
>
> – *Checking sulfated battery plates or other anomalous conditions through periodic inspections*
>
> – *Battery maintenance and surveillance (for battery surveillance requirements, refer to DCD Chapter 16, Section 3.8)*

The commitment was also captured as COL Action Item 8.4.1-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will establish plant procedures for periodic testing of penetration protective devices. (COL Action Item 8.4.1-1)*

The Class 1E 125 volts direct current (Vdc) system components undergo periodic maintenance tests to determine the condition of the system. The applicant has established procedures for inspection and maintenance of Class 1E batteries and non-Class 1E batteries. Class 1E battery maintenance and service testing is performed in conformance with RG 1.129. Batteries are inspected periodically to verify proper electrolyte levels, specific gravity, cell temperature and battery float voltage. Cells are inspected in conformance with IEEE 450 and vendor recommendations. In addition, the applicant has established procedures for

clearing of ground faults on the Class 1E dc system. The battery testing procedures are written in conformance with IEEE 450 and the Technical Specifications. The NRC staff concludes that the applicant has established procedures for inspection and maintenance of Class 1E and non-Class 1E batteries to satisfy COL Information Item 8.3-2; therefore, this item is resolved.

With regard to periodic testing of electrical penetration protective devices (COL Action Item 8.4.1-1) for dc systems, the applicant has not addressed periodic testing of the penetration over load protective devices related to dc systems. In RAI 8.3.1-1, the staff requested that the applicant address the periodic testing of the electrical penetration primary and backup protective devices protecting Class 1E and non-Class 1E dc circuits. In a letter dated January 2, 2009, the applicant stated that the BLN COL FSAR will be revised in the next COLA submittal to include periodic testing of the electrical penetration primary and backup protective devices protecting Class 1E and non-Class 1E dc circuits, as well as control of protective devices. The staff has reviewed the information in the applicant's response, which provided for the testing of Class 1E and non-Class 1E dc penetration overload protection devices. The staff also reviewed the proposed change to BLN COL FSAR Section 8.3.1.1.6 and concludes that COL Action Item 8.4.1-1 is resolved subject to the verification that the BLN COL FSAR has been updated to include portions of the RAI response. This is identified as ***Confirmatory Item 8.3.2-1****.*

Resolution of Standard Content Confirmatory Item 8.3.2-1

Confirmatory Item 8.3.2-1 required the applicant to update its FSAR to provide for the testing of Class 1E and non-Class 1E dc penetration overload protection devices. The NRC staff verified that the VEGP COL FSAR was appropriately updated. As a result, Confirmatory Item 8.3.2-1 is resolved.

Evaluation of Tier 2 Departure STD DEP 8.3-1 and Revised STD COL 8.3-2

In a letter dated June 18, 2010, Westinghouse provided a response to Open Item OI-SRP8.3.2-EEB-09, Revision 3, related to the periodic testing of battery chargers and voltage regulating transformers. The response included a COL information item to be added to AP1000 DCD Section 8.3.3 to ensure that periodic testing is performed on the battery chargers and voltage regulating transformers. Specifically, this section will be revised to include the following COL information item:

> *The Combined License applicant will establish plant procedures as required for:*
>
> > *Combined License applicants referencing the AP1000 certified design will ensure that periodic testing is performed on the battery chargers and voltage regulating transformers.*

In a letter dated October 15, 2010, the applicant submitted its response to address the above identified AP1000 DCD revision to the Section 8.3.3 COL information item regarding battery charger and voltage regulating transformer

testing. The applicant stated that procedures are established for periodic testing of the Class 1E battery chargers and the Class 1E regulating transformers in accordance with the manufacturer recommendations. The battery chargers and regulating transformers are tested periodically in accordance with manufacturer recommendations. Circuit breakers in the Class 1E battery chargers and Class 1E voltage regulating transformers that are credited for an isolation function are tested through the use of breaker test equipment. This verification confirms the ability of the circuit to perform the designed coordination and corresponding isolation function between Class 1E and non-Class 1E components. Circuit breaker testing is done as part of the MR program and testing frequency is determined by that program. Fuses/fuse holders that are included in the isolation circuit are visually inspected. Class 1E battery chargers are tested to verify current limiting characteristic utilizing manufacturer recommendation and industry practices. Testing frequency is in accordance with that of the associated battery.

The applicant clarified that the voltage regulating transformers do not have active components to limit current and, therefore, the voltage regulating transformer in combination with fuses and/or breakers will interrupt the input or output (ac) current under faulted conditions on the output side. The NRC staff finds this to be inconsistent with AP1000 DCD Section 8.3.2.2, which states that Class 1E voltage regulating transformers are designed to limit the input (ac) current to an acceptable value under faulted conditions on the output side. As such the use of the breakers/fuses for regulating transformers for isolation function in lieu of current limiting characteristics as presented in the AP1000 DCD is a departure for VEGP. The applicant stated that Part 7 of the COL application will be revised to include a departure from AP1000 DCD Section 8.3.2.2 clarifying the current limiting feature of voltage regulating transformers. The applicant has included, in its response, the appropriate changes related to the above departure that will be included in VEGP COL FSAR Sections 8.3.2.1.4 and 8.3.2.2, in Chapter 1, Table 1.8-201 and in Part 7 of the VEGP COL application. These changes will be included in a future revision to the VEGP COL application.

The NRC staff has reviewed the proposed changes to the VEGP COL application and concludes that the applicant has provided sufficient information regarding the isolation function and the periodic inspection and testing of the isolating devices for the Class 1E battery chargers and Class 1E voltage regulating transformers. In addition, the staff finds that, although the use of the breakers/fuses for regulating transformers isolation function in lieu of current limiting characteristics as presented in the AP1000 DCD is a departure for VEGP, the departure is acceptable because the use of the breakers/fuses for regulating transformers for isolation function is consistent with the recommendations in IEEE-384, "IEEE Standard Criteria for Independence of Class 1E Equipment and Circuits," endorsed by RG 1.75. Therefore, AP1000 COL Information Item STD DEP 8.3-1 and the revised STD COL 8.3-2 are resolved subject to NRC staff verification of the revision to the VEGP COL FSAR sections discussed above. This is being tracked as ***Confirmatory Item 8.3.2-2****.*

Resolution of Standard Content Confirmatory Item 8.3.2-2

Confirmatory Item 8.3.2-2 is an applicant commitment to revise its FSAR Table 1.8-201 and Section 8 3.2.1.4 to address COL Information Item STD COL 8.3-2 and a departure, STD DEP 8.3-1. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 8.3.2-2 is now closed.

The following portion of this technical evaluation section is reproduced from Section 8.3.2.4 of the BLN SER:

Supplemental Information

- *STD SUP 8.3-1*

STD SUP 8.3-1 was provided by the applicant indicating that there are no site-specific non-Class 1E dc loads connected to the Class 1E dc system. The staff finds this acceptable because it is consistent with the guidance in RG 1.206.

Evaluation of Site-specific Response to Standard Content

In VEGP COL FSAR, Revision 2, the VEGP applicant changed the number of the supplemental information item from STD SUP 8.3-1 to STD SUP 8.3-3. The associated VEGP COL FSAR, Revision 2 text, which is identical to the BLN COL FSAR, Revision 1 text accepted by the staff, was not changed. Therefore, the staff concludes that this difference is not relevant and that the staff's evaluation of STD SUP 8.3-1 for BLN applies to STD SUP 8.3-3 for VEGP.

8.3.2.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

8.3.2.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to dc power systems, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the relevant NRC regulations, guidance in NUREG-0800, Section 8.3.2, and other NRC regulatory guides and concludes that the applicant is in compliance with the NRC regulations. The staff based its conclusion on the following:

- STD COL 8.3-2, the applicant provided sufficient information involving the inspection, maintenance, and testing of Class 1E batteries, the clearing of ground faults on the Class 1E dc system, and periodic testing of the battery chargers and voltage regulating transformers.

- STD SUP 8.3-3, the applicant made a commitment that there are no site-specific non-Class 1E dc loads connected to the Class 1E dc system.

- STD DEP 8.3-1, the applicant provided sufficient information involving the use of breakers/fuses for regulating transformers for isolation function that is consistent with IEEE-384, endorsed by RG 1.75.

Table 8.2A-1. Offsite Power System

Design Commitment	Inspections, Tests, and Analyses	Acceptance Criteria
1. A minimum of one offsite circuit supplies electric power from the transmission network to the interface with the onsite ac power system.	Inspections of the as-built offsite circuit will be performed.	At least one offsite circuit is provided from the transmission switchyard interface to the interface with the onsite ac power system.
2. Each offsite power circuit interfacing with the onsite ac power system is adequately rated to supply assumed loads during normal, abnormal and accident conditions.	Analyses of the offsite power system will be performed to evaluate the as-built ratings of each offsite circuit interfacing with the onsite ac power system against the load assumptions.	A report exists and concludes that each as-built offsite circuit is rated to supply the load assumptions during normal, abnormal and accident conditions.
3. During steady state operation, each offsite power source is capable of supplying required voltage to the interface with the onsite ac power system that will support operation of assumed loads during normal, abnormal and accident conditions.	Analyses of the as-built offsite circuit will be performed to evaluate the capability of each offsite circuit to supply the voltage requirements at the interface with the onsite ac power system.	A report exists and concludes that during steady state operation each as-built offsite circuit is capable of supplying the voltage at the interface with the onsite ac power system that will support operation of assumed loads during normal, abnormal and accident conditions.
4. During steady state operation, each offsite circuit is capable of supplying required frequency to the interface with the onsite ac power system that will support operation of assumed loads during normal, abnormal and accident conditions.	Analyses of the as-built offsite circuit will be performed to evaluate the capability of each offsite circuit to supply the frequency requirements at the interface with the onsite ac power system.	A report exists and concludes that during steady state operation each as-built offsite circuit is capable of supplying the frequency at the interface with onsite ac power system that will support operation of assumed loads during normal, abnormal and accident conditions.
5. The fault current contribution of each offsite circuit is compatible with the interrupting capability of the onsite short circuit interrupting devices.	Analyses of the as-built offsite circuit will be performed to evaluate the fault current contribution of each offsite circuit at the interface with the onsite ac power system.	A report exists and concludes the short circuit contribution of each as-built offsite circuit at the interface with the onsite ac power system is compatible with the interrupting capability of the onsite fault current interrupting devices
6. The reactor coolant pumps continue to receive power from either the main generator or the grid for a minimum of 3 seconds following a turbine trip.	Analyses of the as-built offsite power system will be performed to confirm that power will be available to the reactor coolant pumps for a minimum of 3 seconds following a turbine trip when the buses powering the reactor coolant pumps are aligned to either the UATs or the RATs.	A report exists and concludes that voltage at the high-side of the GSU, and the RATs, does not drop more than 0.15 pu from the pre-trip steady-state voltage for a minimum of 3 seconds following a turbine trip when the buses powering the reactor coolant pumps are aligned to either the UATs or the RATs.

9.0 AUXILIARY SYSTEMS

The auxiliary systems provide support systems that support the safe shutdown of the plant or the protection of the health and safety of the public. This area covers a wide range of systems including fuel storage and handling, water systems, compressed air, process sampling, drains, heating, ventilation, and air conditioning (HVAC), fire protection, communications, lighting, and emergency diesel generator support systems.

9.1 Fuel Storage and Handling

9.1.1 New Fuel Storage (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.1.1, "Criticality Safety of Fresh and Spent Fuel Storage and Handling," and C.I.9.1.2, "New and Spent Fuel Storage")

The new fuel storage facilities include the fuel assembly storage racks, the concrete storage pit that contains the storage racks, and auxiliary components including the spent fuel handling crane and pit cover. The storage facilities must maintain the new fuel in subcritical arrays during all credible storage conditions. In addition, new fuel must remain subcritical during fuel handling.

Section 9.1 of the V.C. Summer Nuclear Station (VCSNS) combined license (COL) Final Safety Analysis Report (FSAR), Revision 5 incorporates by reference, with no departures or supplements, Section 9.1.1, "New Fuel Storage," of Revision 19 of the AP1000 Design Control Document (DCD). The Nuclear Regulatory Commission (NRC) staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[8] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," and its supplements.

9.1.2 Spent Fuel Storage (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.1.1, "Criticality Safety of Fresh and Spent Fuel Storage and Handling," and C.I.9.1.2, "New and Spent Fuel Storage")

9.1.2.1 *Introduction*

The spent fuel storage facilities include the spent fuel storage racks, the spent fuel storage pool that contains the storage racks, and the associated equipment storage pits. The storage facilities must maintain the spent fuel in subcritical arrays during all credible storage conditions. In addition, spent fuel must remain subcritical during fuel handling.

9.1.2.2 *Summary of Application*

Section 9.1 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.1 of the AP1000 DCD, Revision 19. Section 9.1 of the DCD includes Section 9.1.2.

[8] See Section 1.2.2 for a discussion of the staff's review related to verification of the scope of information to be included in a COL application that references a design certification (DC).

In addition, in VCSNS COL FSAR Section 9.1.6, the applicant provided the following:

AP1000 COL Information Item

- STD COL 9.1-7

The applicant provided additional information in standard (STD) COL 9.1-7 to address COL Information Item 9.1-7.

License Condition

- Part 10, License Condition 2, Item 9.1-7

The applicant proposed a license condition related to STD COL 9.1-7 that sets the implementation milestone for the Metamic Coupon Monitoring Program.

- Part 10, License Condition 6

The applicant proposed a license condition to provide a schedule to support the NRC's inspection of operational programs and proposed to add the Metamic Monitoring Program to this list. The VCSNS applicant made this proposal through its endorsement, in a letter dated August 24, 2010, of the letter dated April 23, 2010, from the Vogtle Electric Generating Plant (VEGP) applicant on this issue.

9.1.2.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the fuel storage and handling are given in Section 9.1.2 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)."

The regulatory basis for acceptance of the COL information and supplementary information items are established in:

- Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic licensing of production and utilization facilities," Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criteria (GDC) 4, "Environmental and Dynamic Effects Design Bases"

- GDC 61, "Fuel Storage and Handling and Radioactivity Control"

9.1.2.4 *Technical Evaluation*

The NRC staff reviewed Section 9.1.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to spent fuel storage. The results of the NRC staff's evaluation of the

information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this safety evaluation report (SER) provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP, Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs).

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application. Any confirmatory items in the standard content material retain the numbers assigned in the VEGP SER. Confirmatory items that are first identified in this SER section have a VCSNS designation (e.g., Confirmatory Item VCSNS 9.1-1).

The following portion of this technical evaluation section is reproduced from Section 9.1.2.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 9.1-7*

COL Information Item 9.1-7 states:

> *The Combined License holder will implement a spent fuel rack Metamic coupon monitoring program when the plant is placed into commercial operation. This program will include tests to monitor bubbling, blistering, cracking, or flaking; and a test to monitor for corrosion, such as weight loss measurements and or visual examination.*

STD COL 9.1-7 states:

> *A spent fuel rack Metamic coupon monitoring program is to be implemented when the plant is placed into commercial operation. This program includes tests to monitor bubbling, blistering,*

cracking, or flaking; and a test to monitor for corrosion, such as weight loss measurements and or visual examination.

The NRC staff reviewed STD COL 9.1-7 related to the Metamic coupon monitoring program included under Section 9.1 of the BLN COL FSAR. No additional details on the Metamic Coupon Monitoring Program are provided in Section 9.1 of the FSAR.

Since the applicant's proposed resolution of COL Information Item 9.1-7 was a restatement of the text of the COL information item from the DCD, the staff required additional information to be able to evaluate the applicant's closure of the item. An additional Request for Additional Information (RAI) response related to AP1000 DCD Section 9.1.2 (ML091120720) proposed a modification to the text of COL Information Item 9.1-7. The modified wording added neutron attenuation and thickness testing to the list of tests to be included in the Metamic monitoring program to be implemented by the COL holder. In RAI 9.1.2-1, the NRC staff requested that the applicant describe in detail the implementation of the aspects of the Metamic coupon monitoring program that are listed in STD COL 9.1-7, as modified by the additional AP1000 RAI response. In response to RAI 9.1.2-1, the applicant proposed modified wording for STD COL 9.1-7 as follows:

STD COL 9.1-7

A spent fuel rack Metamic coupon monitoring program is to be implemented when the plant is placed into commercial operation. This program includes tests to monitor bubbling, blistering, cracking, or flaking; and a test to monitor for corrosion, such as weight loss measurements and / or visual examination. The program will also include tests to monitor changes in physical properties of the absorber material, including neutron attenuation and thickness measurements.

*This proposed wording matches the proposed revised text for AP1000 COL Information Item 9.1-7. However, the proposed wording is still a restatement of the COL information item and does not contain the level of detail needed by the staff to evaluate the adequacy of the Metamic monitoring program. Therefore, in RAI 9.1.2-2, the staff requested that the applicant describe the methodology and acceptance criteria for the tests listed, provide the corrective action requirements and provide the administrative controls applicable to the program. Additionally, the applicant should confirm the number of coupons and the withdrawal schedule will be the same as recommended in the DCD or provide an alternative. The staff has identified this as **Open Item 9.1-1** to track resolution of this issue and to ensure that the additional details are included in the BLN COL FSAR.*

Resolution of Standard Content Open Item 9.1-1

To resolve Open Item 9.1-1, the VEGP applicant provided additional information in a letter dated April 23, 2010, which superseded the original response to Open Item 9.1-1 provided in a letter dated December 30, 2009.

With respect to the number of coupons and the withdrawal schedule, the applicant confirmed that the number of coupons and the withdrawal schedule will be the same as stated in AP1000 DCD, Section 9.1.2.2.1. The applicant further stated that since AP1000 DCD Section 9.1 is incorporated by reference into the FSAR, no additional FSAR change would be required. The staff finds the applicant's response regarding the number of coupons and withdrawal schedule acceptable, because the applicant has confirmed the number of coupons and schedule will be the same as described in the AP1000 DCD.

With respect to methodology and acceptance criteria, corrective actions and administrative controls, the applicant stated that since the Metamic Coupon Monitoring Program has not yet been established, the level of detail requested is not completely available. The applicant further stated, "As stated in FSAR Subsection 9.1.6, a Metamic monitoring program will be implemented when the plant is placed into commercial operation. This program will include methodology to be employed, acceptance criteria, corrective actions and a description of administrative controls based on vendor recommendations and industry operating experience."

The applicant additionally stated that the VEGP COL FSAR will be revised to add the following to the end of the STD COL 9.1-7 discussion:

> *The program will include the methodology and acceptance criteria for the tests listed and provide corrective action requirements based on vendor recommendations and industry operating experience. The program will be implemented through plant procedures.*
>
> *<u>Metamic Monitoring Acceptance Criteria</u>:*
>
> - *Verification of continued presence of the boron is performed by neutron attenuation measurement. A decrease of no more than 5 percent in Boron-10 content, as determined by neutron attenuation, is acceptable. This is equivalent to a requirement for no loss in boron within the accuracy of the measurement.*
>
> - *Coupons are monitored for unacceptable swelling by measuring coupon thickness. An increase in coupon thickness at any point of no more than 10 percent of the initial thickness at that point is acceptable.*

Changes in excess of either of the above two acceptance criteria are investigated under the corrective action program and may require early retrieval and measurement of one or more of the remaining coupons to provide validation that the indicated changes are real. If the deviation is determined to be real, an engineering evaluation is performed to identify further testing or any corrective action that may be necessary.

Additional parameters are examined for early indications of the potential onset of Metamic degradation that would suggest a need for further attention and possibly

a change in the coupon withdrawal schedule. These include visual inspection for surface pitting, blistering, cracking, corrosion or edge deterioration, or unaccountable weight loss in excess of the measurement accuracy.

The NRC staff concludes that the above information to be added to the VEGP COL FSAR provides the necessary level of detail for the Metamic Monitoring Program, including the methodology and acceptance criteria for the tests listed, the corrective action requirements, and the administrative controls applicable to the program.

The applicant proposed a markup of the VEGP COL application, Part 10, License Condition 6, adding a line item for the Metamic Monitoring Program. After the addition of this line item, the version of License Condition 6 included in Part 10 of the COL application, Revision 2, would be:

> *The licensee shall develop a schedule that supports planning for and conduct of NRC inspection of the operational program listed in VEGP COL FSAR Table 13.4-201, "Operational Program Required by NRC Regulations." This schedule must be available to the NRC staff no later than 12 months after issuance of the COL. The schedule shall be updated every 6 months until 12 months before scheduled fuel load, and every month thereafter until the operational programs listed in VEGP COL FSAR Table 13.4-201 have been fully implemented or the plant has been placed in commercial service, whichever comes first. This schedule shall address:*
>
> *a. the implementation of site-specific Severe Accident Management Guidance.*
>
> *b. the reactor vessel pressurized thermal shock evaluation at least 18 months prior to initial fuel load.*
>
> *c. the approved preoperational and startup test procedures in accordance with FSAR Section 14.2.3.*
>
> *d. the flow accelerated corrosion (FAC) program implementation, including the construction phase activities.*
>
> *#. the spent fuel rack Metamic coupon monitoring program implementation.*
>
> *(Where # will be replaced with the next sequential number in the final version of this license condition.)*

The inclusion of the Metamic Coupon Monitoring Program in License Condition 6 ensures that the program will be treated as an operational program with respect to providing a schedule to support the NRC's inspection; thus, the applicant must submit and update the schedule for program implementation following the issuance of the COL, in order to support planning of NRC inspections. The staff, therefore, finds the applicant's proposed resolution of ***Open Item 9.1-1***

acceptable because the applicant will modify proposed License Condition 6 to ensure the appropriate information is available for the staff's review of the details of the Metamic Monitoring Program prior to the start of plant operation. ***Open Item 9.1-1*** *is, therefore, resolved. Incorporation of the proposed revision to Chapter 9 of the VEGP COL FSAR and to License Condition 6 in the VEGP COL application is being tracked as* ***Confirmatory Item 9.1-1****.*

Resolution of Standard Content Confirmatory Item 9.1-1

Confirmatory Item 9.1-1 is an applicant commitment to revise its FSAR Section 9.1.6 to include a requirement for inclusion of methodology, acceptance criteria and corrective action in the Metamic Coupon Monitoring Program. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 9.1-1 is now closed.

9.1.2.5 *Post Combined License Activities*

For the reasons discussed in the technical evaluation section above, the staff finds the following license condition proposed by the applicant acceptable:

- License Condition (9-1) - Prior to initial fuel load, the licensee shall implement the spent fuel rack Metamic Coupon Monitoring Program. No later than 12 months after issuance of the COL, the licensee shall submit to the Director of the Office of New Reactors (NRO) a schedule that supports planning for and conduct of NRC inspections of the spent fuel rack Metamic Coupon Monitoring Program. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the spent fuel rack Metamic Coupon Monitoring Program has been fully implemented.

9.1.2.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to spent fuel storage, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidelines given in Section 9.1.2 of NUREG-0800. The staff based its conclusion on the following:

- STD COL 9.1-7 is acceptable because the necessary level of detail for the Metamic Coupon Monitoring Program has been provided by the applicant, including the methodology and acceptance criteria for the tests listed, the corrective action requirements, and the administrative controls applicable to the program.

9.1.3 Spent Fuel Pool Cooling System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.1.3, "Spent Fuel Pool Cooling and Cleanup System")

9.1.3.1 *Introduction*

The spent fuel pool cooling system (SFS) is designed to remove decay heat, which is generated by stored fuel assemblies from the water in the spent fuel pool (SFP). The safety-related portion of the SFS credits the water inventory in the pool and safety-related makeup water to remove the decay heat. The nonsafety-related portion of the system is an active system during normal operations that pumps the high temperature water from within the fuel pool through a heat exchanger, and then returns the water to the pool. The SFS heat exchangers are cooled by the component cooling water system (CCS). A secondary function of the SFS is clarification and purification of the refueling water and the SFP.

9.1.3.2 *Summary of Application*

Section 9.1 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.1 of the AP1000 DCD, Revision 19. Section 9.1 of the DCD includes Section 9.1.3. The advanced safety evaluation (ASE) with confirmatory items for Section 9.1.3 was based on VCSNS COL FSAR, Revision 2 and DCD, Revision 17. After submitting VCSNS COL FSAR, Revision 2, the applicant revised a COL information item (COL VCS DEP 2.0-2) that affected this section. This revised COL information item has been incorporated into VCSNS COL FSAR, Revision 4 and the resolution of the confirmatory item associated with this revision is discussed below.

For VCSNS COL FSAR Section 9.1.3, no departures and/or supplements were identified in Revision 2 of the VCSNS COL FSAR; however, based on a letter dated June 30, 2010, additional information was provided by the applicant, as described below.

In addition, in VCSNS COL Part 7, the applicant provided the following:

Tier 1 and Tier 2 Exemption and Departure Request

The applicant proposed the following Tier 1 and Tier 2 departure (DEP) from the AP1000 DCD:

- VCS DEP 2.0-2

The Tier 1 departure request is from a site parameter value provided in AP1000 DCD Tier 1, Table 5.0-1 for the maximum safety wet-bulb (noncoincident) air temperature, which is 30.06 °Celsius (C) (86.1 °Fahrenheit (F)). The Tier 2 departure request is because this site parameter value is also listed as the maximum safety wet-bulb (noncoincident) air temperature in AP1000 DCD Tier 2, Table 2-1.

In its June 30, 2010, letter, the applicant proposed to add the following information as part of VCS DEP 2.0-2 at the end of the third bullet in VCSNS COL FSAR Section 9.1.3.1.3.1:

> SFS performance following restart after a normal refueling is affected by a change in maximum safety wet bulb temperature. Calculations confirm that spent fuel pool temperature remains below 115°F with a CCS supply temperature of 97°F at the specified pool spent fuel loading condition and decay time on the fuel fraction just replaced during the previous 17 day refueling outage. While the maximum CCS temperature expected for VCSNS Units 2 and 3 is 97.3°F, an

increase of 0.3°F in CCS supply temperature will produce a similar increase in the spent fuel pool maximum temperature; therefore, the requirement to maintain spent fuel temperature below 120°F is met with margin ([FSAR] Reference 201).

The exemption request related to the AP1000 DCD maximum safety wet-bulb (noncoincident) air temperature involves an exemption to 10 CFR Part 52, "Licenses, certifications, and approvals for nuclear power plants," Appendix D, "Design Certification Rule for the AP1000 Design," Section IV.A.2.d. Specifically, the VCSNS applicant requested an exemption from a site parameter value provided in AP1000 DCD Tier 1, Table 5.0-1 for the maximum safety wet-bulb (noncoincident) air temperature. The exemption request is evaluated in Section 2.0.4 of this SER.

9.1.3.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the SFS are given in Section 9.1.3 of NUREG-0800.

9.1.3.4 *Technical Evaluation*

The NRC staff reviewed Section 9.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the CCS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Tier 1 and Tier 2 Departure

- VCS DEP 2.0-2

VCS DEP 2.0-2 proposes to increase the maximum safety wet-bulb (noncoincident) air temperature from 30.06 °C (86.1 °F) to 30.72 °C (87.3 °F). This change impacts the performance of various structures, systems, and components (SSCs) described in the AP1000 DCD. The staff's evaluation of this proposed change is also discussed in Sections 2.0, 2.3.1, 5.4, 6.2, 6.4, 9.2.2, and 9.2.7 of this SER.

The nonsafety portion of the SFS is designed to remove decay heat generated by the stored fuel assemblies from the water in the SFP and transfer it to the CCS. The site temperature (wet and dry bulb) impacts the cooling tower performance, which affect the temperature of the CCS. The SFS heat exchanger is cooled by the CCS, and a change in the CCS temperature affects the performance of the SFS. The impact of the proposed change on the CCS system is evaluated in Section 9.2.2 of this SER. Since the safety-related portion of the SFS does not credit the use of the CCS, it remains unaffected by the proposed change.

The performance of the SFS is evaluated in the AP1000 DCD for several limiting offload scenarios. Of all the evaluated scenarios, only one scenario uses the maximum safety wet-bulb (noncoincident) air temperature as the basis to determine the system's heat removal performance. In this scenario, the analysis must demonstrate that the SFS is capable of maintaining the temperature of the SFP water below 48.9 °C (120 °F) following a partial core fuel shuffle refueling, with the wet bulb temperature at the maximum safety wet-bulb (noncoincident) air temperature (most limiting case).

In its June 30, 2010, letter, the applicant included Enclosure 3, "Evaluation Impacts: Change to Maximum Safety Non-Coincident Ambient Wet Bulb Temperature." This report references the calculation "APP-SFS-M3C-042, Revision 0, SFS HX Sizing Calculation Using Florida Power and Light (Turkey Point) Increased Wet Bulb Temperatures" as the basis that demonstrate that the VCSNS SFS still meets its design basis with the new wet bulb temperature. APP-SFS-M3C-042 concluded that with a CCS temperature of 36.1 °C (97 °F), the Turkey Point SFP temperature remains below 46.1 °C (115 °F). This report was performed following the same methodology used in Westinghouse Technical Report (TR)-36 (APP-GW-GLE-036), "Impact of a Revision to the Current Wet Bulb Temperature Identified in Table 5.0-1 (Tier 1) and Table 2-1 (Sheet 1 of 3) of the DCD (Revision 16)" for the AP1000 DC. The staff has evaluated this Westinghouse methodology as part of its AP1000 DCD review and found it acceptable in Supplement 2 of NUREG-1793. Therefore, the staff finds that referencing APP-SFS-M3C-042 for VCSNS is acceptable.

As described in the markup for VCSNS FSAR Section 9.2, the maximum design temperature for the CCS is 36.27 °C (97.3 °F). The VCSNS CCS maximum temperature is 0.17 °C (0.3 °F) higher than the temperature assumed for Turkey Point CCS in APP-SFS-M3C-042. The applicant stated that an increase in the CCS temperature will cause a proportional increase in the SFP temperature of approximately 0.17 °C (0.3 °F). This would result in a VCSNS SFP water temperature of approximately 46.3 °C (115.3 °F). Therefore, the staff finds that the VCSNS SFS is capable of maintaining the SFP water temperature below 48.9 °C (120 °F) following a partial core fuel shuffle refueling at the maximum safety wet-bulb (noncoincident) air temperature.

The applicant also proposed to revise VCSNS FSAR Section 9.1.3.1.3.1 to reflect the impact of the change in the maximum safety wet-bulb (noncoincident) air temperature. Since the modification clarifies that only the refueling scenario discussed in this section (following a restart after a normal refueling, while the reactor is at power) has been impacted by the change in the maximum safety wet-bulb (noncoincident) air temperature, and that the VCSNS SFS is still capable of maintaining the SFP water temperature below the limit of 48.9 °C (120 °F), the staff finds this proposed FSAR change acceptable. This is being tracked as **Confirmatory Item VCSNS 9.1-1** pending the applicant's issuance of a future revision to the VCSNS COL FSAR. Since this confirmatory item is unique to VCSNS, it has a VCSNS designation.

Resolution of Confirmatory Item VCSNS 9.1-1

Confirmatory Item VCSNS 9.1-1 is an applicant commitment to revise its FSAR Section 9.1.3.1.3.1 to reflect the impact of the change in the maximum safety wet-bulb (noncoincident) air temperature. The staff verified that the VCSNS COL FSAR was appropriately revised. As a result, Confirmatory Item VCSNS 9.1-1 is now closed.

9.1.3.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

9.1.3.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to SFS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the requirements of NRC regulations, and the acceptance criteria in NUREG-0800, Section 9.1.3. The staff based its conclusion on the following:

- VCS DEP 2.0-2 is acceptable because the staff determined that the SFS is capable of maintaining the SFP water temperature below 48.9 °C (120 °F) following a partial core fuel shuffle refueling, with the wet bulb temperature at the maximum safety wet-bulb (noncoincident) air temperature of 30.72 °C (87.3 °F). Therefore, the staff concludes that the VCSNS SFS is acceptable.

9.1.4 Light Load Handling System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.1.4, "Light Load Handling System (Related to Refueling)")

9.1.4.1 *Introduction*

The light-load handling system (LLHS) consists of the equipment and structures needed for the refueling operation. This equipment is comprised of fuel assemblies, core component and reactor component hoisting equipment, handling equipment, and a dual basket fuel transfer system. The structures associated with the fuel handling equipment are the refueling cavity, the transfer canal, the fuel transfer tube, the SFP, the cask loading area, the new fuel storage area, and the new fuel receiving and inspection area.

9.1.4.2 *Summary of Application*

Section 9.1 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.1 of the AP1000 DCD, Revision 19. Section 9.1 of the DCD includes Section 9.1.4.

In addition, in VCSNS COL FSAR Section 9.1.4, the applicant provided the following:

AP1000 COL Information Items

- STD COL 9.1-5

The applicant provided additional information in STD COL 9.1-5 to address COL Information Item 9.1-5 (COL Action Item 9.1.6-5).

- STD COL 9.1-6

The applicant provided additional information in STD COL 9.1-6 to address COL Information Item 9.1-6 (COL Action Item 9.1.6-6).

9.1.4.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the LLHS are given in Section 9.1.4 of NUREG-0800.

The regulatory basis for acceptance of the COL information items are established in:

- GDC 61

- American National Standards Institute/American Nuclear Society (ANSI/ANS) 57.1-1992, "Design Requirements for LWR Fuel Handling Systems"

9.1.4.4 *Technical Evaluation*

The NRC staff reviewed Section 9.1.4 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the LLHS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference

COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 9.1.4.4 of the VEGP SER:

AP1000 COL Information Items

- *STD COL 9.1-5*

COL Information Item 9.1-5 states:

> *The Combined License applicant is responsible for a program for inservice inspection of the light load handling system as specified in subsection 9.1.4.4 and the overhead heavy load handling system in accordance with ANSI B30.2, ANSI B30.9, ANSI N14.6, and ASME [American Society of Mechanical Engineers] NOG-1 as specified in subsection 9.1.5.4.*

The commitment was also captured as COL Action Item 9.1.6-5 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The Combined License applicant is responsible for a program for inservice inspection of the light load handling system as specified in DCD Tier 2, Section 9.1.4.4 and the overhead heavy load handling system in accordance with ANSI B30.2, ANSI B30.9, ANSI N14.6, and ASME NOG-1 as specified in DCD Tier 2, Section 9.1.5.4.*

STD COL 9.1-5 states:

> *The above requirements are part of the plant inspection program for the light load handling system, which is implemented through procedures. In addition to the above inspections, the procedures reflect the manufacturers' recommendations for inspection.*

The staff reviewed STD COL 9.1-5, which addresses COL Information Item 9.1-5 on the inservice inspection (ISI) program for the LLHS. The applicant stated that the inspection program for the LLHS is implemented through procedures and reflect the manufacturer's recommendations. RAI 9.1.4-1 requested that the applicant provide a copy of the procedures for verification by the staff or provide the schedule in relation to fuel loading for issuance of the procedures.

The applicant stated in its response to RAI 9.1.4-1, that an inspection and testing program will be developed to address the LLHS. Procedures defining the program will address the testing and inspection requirements outlined in Section 9.1.4.4, "Inspection and Test Requirements," of the AP1000 DCD and the procedures will include applicable manufacturer's recommendations and industry standards. The applicant stated that procedure development is tracked by the overall plant construction and test schedule. The applicant further stated that details of the implementation milestones for development of procedures are

not currently available and are not expected to be available until a detailed construction schedule has been developed. When it becomes available, scheduling information will be provided to the NRC as necessary to support timely completion of NRC inspection and audit functions.

Although the response to RAI 9.1.4-1 states that the plant inspection program schedule information will be provided when available, BLN COL FSAR Table 1.8-202 lists STD COL 9.1-5 as having been completed by the applicant. The staff notes that STD COL 9.1-5 has not been fully addressed. The applicant is asked to revise BLN COL FSAR Table 1.8-202 to commit in the BLN COL FSAR to implementing the plant inspection program for the LLHS before receipt of fuel. This is ***Open Item 9.1-2****.*

- *STD COL 9.1-6*

COL Information Item 9.1-6 states:

> *The Combined License applicant is responsible to ensure an operating radiation monitor is mounted on any crane or fuel handling machine when it is handling fuel.*

The commitment was also captured as COL Action Item 9.1.6-6 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant/holder will ensure that an operating radiation monitor is mounted on any crane or fuel handling machine when it is handling fuel.*

STD COL 9.1-6 states:

> *Plant procedures require that an operating radiation monitor is mounted on any machine when it is handling fuel. Refer to DCD Subsection 11.5.6.4, "Fuel Handling Area Criticality Monitors," for a discussion of augmented radiation monitoring during fuel handling operations.*

The NRC staff reviewed STD COL 9.1-6, which addresses COL Information Item 9.1-6 related to radiation monitoring included under Section 9.1.4 of the BLN COL FSAR. The proposed mounting of an operating radiation monitor on any crane or fuel handling machine during fuel handling is included under Section 9.1.4.3.8 of the BLN COL FSAR. The applicant committed to develop plant procedures that will specify that an operating radiation monitor be mounted on any fuel handling machine when it is handling fuel. DCD Section 11.5.6.4 specifies the need to augment area radiation monitoring during fuel handling operations by a portable radiation monitor on the machine handling fuel. The staff finds that with the addition of the portable radiation monitor to any fuel handling machine when it is handling fuel, the BLN COL FSAR meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 61 for the prevention of unacceptable radiation exposure.

The staff finds that the applicant has adequately addressed COL Information Item 9.1-6 which would ensure that an operating portable radiation monitor is mounted on any fuel handling machine in the LLHS when it is handling fuel.

Resolution of Standard Content Open Item 9.1-2

*To resolve **Open Item 9.1-2**, in a letter dated December 30, 2009, the applicant proposed a change to VEGP COL FSAR Section 9.1.4.4 in response to this open item instead of a revision to Table 1.8-202. The applicant proposed a revision to FSAR Section 9.1.4.4 to clarify that the LLHS, including system inspections, is implemented prior to receipt of fuel onsite. The staff finds this acceptable since the commitment provided will ensure that these procedures will be in place prior to fuel movement. Therefore, **Open Item 9.1-2** is resolved. Incorporation of the proposed revision in the VEGP COL FSAR is being tracked as **Confirmatory Item 9.1-2**.*

Resolution of Standard Content Confirmatory Item 9.1-2

Confirmatory Item 9.1-2 is an applicant commitment to revise its FSAR Section 9.1.4.4 to include an inspection of the LLHS prior to receipt of fuel. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 9.1-2 is now closed.

Correction of Error in the Standard Content Evaluation Text

The NRC staff identified an error in the text reproduced above from Section 9.1.4.4 of the BLN SER that requires correction. The BLN SER provides quoted material for COL Action Item 9.1.6-5, citing Appendix F of NUREG-1793 as the source. The source of the quoted material for COL Action Item 9.1.6-5 is in fact from Chapter 9 (Section 9.1.6) of NUREG-1793.

9.1.4.5 *Post Combined License Activities*

For the reasons discussed in the technical evaluation above, the following FSAR commitment is identified as the responsibility of the licensee:

- The light-load handling program, including system inspections, will be implemented prior to receipt of fuel onsite.

9.1.4.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the LLHS and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidelines given in Section 9.1.4 of NUREG-0800. The staff based its conclusion on the following:

- STD COL 9.1-5 is acceptable because the staff finds that the relevant information in the VCSNS COL FSAR provided clarification that ISI of the LLHS is part of the plant inspection program for the LLHS, which is implemented through procedures.

- STD COL 9.1-6 is acceptable because the staff finds that the relevant information in the VCSNS COL FSAR meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 61.

9.1.5 Overhead Heavy Load Handling Systems (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.1.5, "Overhead Load Handling System")

9.1.5.1 *Introduction*

The overhead heavy-load handling system (OHLHS) is used to lift loads whose weight is greater than the combined weight of a single spent fuel assembly and its handling device. The principal equipment is the containment polar crane, equipment hatch hoist, maintenance hatch hoist, and the cask handling crane. The OHLHS is designed to ensure that inadvertent operations or equipment malfunctions, separately or in combination, will not cause a release of radioactivity, a criticality accident, an inability to cool fuel within the reactor vessel or SFP, or prevent safe shutdown of the reactor.

9.1.5.2 *Summary of Application*

Section 9.1 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.1 of the AP1000 DCD, Revision 19. Section 9.1 of the AP1000 DCD includes Section 9.1.5.

In addition, in VCSNS COL FSAR Section 9.1.5, the applicant provided the following:

Supplemental Information

- STD SUP 9.1-1

The applicant provided supplemental (SUP) information in Section 9.1.5.3, "Safety Evaluation," describing heavy-load lifts outside those already described in the AP1000 DCD.

- STD SUP 9.1-2

The applicant provided supplemental information in Section 9.1.5, "Overhead Heavy Load Handling Systems," describing key elements of the heavy-loads handling program and a quality assurance (QA) program.

- STD SUP 9.1-3

The applicant provided supplemental information in Section 9.1.5.5, "Load Handling Procedures," describing load handling operations for heavy loads in the vicinity of irradiated fuel and safe shutdown equipment.

AP1000 COL Information Items

- STD COL 9.1-5

The applicant provided additional information in STD COL 9.1-5 to address COL Information Item 9.1-5 (COL Action Item 9.1.6-5).

- STD COL 9.1-6

The applicant provided additional information in STD COL 9.1-6 to address COL Information Item 9.1-6 (COL Action Item 9.1.6-6).

9.1.5.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the OHLHS are given in Section 9.1.5 of NUREG-0800.

The regulatory basis for acceptance of STD SUP 9.1-1, STD SUP 9.1-2 and STD SUP 9.1-3 addressing planned heavy-load lift programs include the following:

- GDC 4
- GDC 61
- NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants"

The regulatory basis for acceptance of STD COL 9.1-5, addressing the ISI program for the OHLHS is based on GDC 4 and the guidelines of NUREG-0612, which references ANSI B30.2, "Overhead and Gantry Cranes"; ANSI N14.6, "Special Lifting Devices for Shipping Containers Weighing 10,000 Pounds or More," ASME NOG-1, "Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder)"; and ANSI B30.9, "Slings."

The regulatory basis for acceptance of STD COL 9.1-6, addressing operating radiation monitor on any crane handling fuel is based on the requirements of GDC 61.

9.1.5.4 *Technical Evaluation*

The NRC staff reviewed Section 9.1.5 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to OHLHS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP

Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 9.1.5.4 of the VEGP SER:

Supplemental Information

- *STD SUP 9.1-1, STD SUP 9.1-2, and STD SUP 9.1-3*

The staff reviewed the information provided by the applicant for STD SUP 9.1-1. The applicant stated that it did not provide an itemized list of heavy load lifts outside the scope of heavy loads described in the AP1000 DCD because no such heavy load lifts are currently planned. The applicant provided a general description for addressing heavy load movements outside the planned scope if needed in the future. However, the applicant did not address all the program elements and detail listed in NUREG-0612 Section 5.1.1 and NUREG-0800 Section 9.1.5, nor did it provide a schedule for implementation of the heavy load handling program. A heavy load handling program that meets the guidelines of NUREG-0612 and NUREG-0800 Section 9.1.5, needs to be in place at a time before there is a possibility that a load drop could cause a release of radioactivity, a criticality accident, inability to cool fuel within the reactor vessel or spent fuel pool, or prevent safe shutdown of the reactor. The staff asked the applicant in RAI 9.1.5-1 to provide the program elements specified in NUREG-0612 Section 5.1.1 and NUREG-0800 Section 9.1.5, and a schedule for implementation.

In BLN COL FSAR, Revision 1, the applicant provided the missing and necessary information specified in NUREG-0612 Section 5.1.1 and NUREG-0800 Section 9.1.5. The applicant provided a description of the key elements of the heavy load handling system program in BLN COL FSAR Section 9.1.5. The key elements are: 1) Listing of heavy loads; 2) Listing of handling equipment; 3) Safe load paths definition, location and evaluation; 4) Procedures and maintenance manuals; 5) Inspection and testing; 6) Personnel qualification and training; and 7) Quality Assurance (QA) program to monitor and

implement the heavy loads program. Also, the BLN COL FSAR, Revision 1 Section 9.1.5 describes the heavy loads handling system procedures. Because Section 9.1.5 of the BLN COL FSAR includes the key elements identified in NUREG-0612, the staff finds the aspects of RAI 9.1.5-1 regarding the key elements of the heavy loads program resolved. Therefore, the staff finds the applicant meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 4.

In its response to RAI 9.1.5-1, the applicant stated that details of the implementation milestones for the development of heavy load handling procedures and related engineering documents are not currently available, nor are the implementation milestones expected to be available until after a detailed construction schedule has been developed. The applicant stated that appropriate scheduling information will be provided, when available, to the NRC as necessary to support timely completion of inspection and audit functions. The applicant did not provide any schedule for when the heavy load handling program will be completed for the implementation of an approved heavy load handling program (including OHLHS procedures). The applicant is asked to revise BLN COL FSAR Table 1.8-202 to commit in the BLN COL FSAR to implementing the heavy load handling program before receipt of fuel. This is ***Open Item 9.1-3****.*

AP1000 COL Information Items

- *STD COL 9.1-5*

The applicant provided additional information in STD COL 9.1-5 to address COL Information Item 9.1-5. COL Information Item 9.1-5 states:

> *The Combined License applicant is responsible for a program for inservice inspection of the light load handling system as specified in subsection 9.1.4.4 and the overhead heavy load handling system in accordance with ANSI B30.2, ANSI B30.9, ANSI N14.6, and ASME NOG-1 as specified in subsection 9.1.5.4.*

The commitment was also captured as COL Action Item 9.1.6-5 in Chapter 9 of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The Combined License applicant is responsible for a program for inservice inspection of the light load handling system as specified in DCD Tier 2, Section 9.1.4.4 and the overhead heavy load handling system in accordance with ANSI B30.2, ANSI B30.9, ANSI N14.6, and ASME NOG-1 as specified in DCD Tier 2, Section 9.1.5.4.*

The staff reviewed STD COL 9.1-5, which addresses COL Information Item 9.1-5 on the plant inspection program for the OHLHS. The applicant stated that the inspection program for the OHLHS is implemented through procedures and reflect the manufacturer's recommendations and the recommendations of NUREG-0612. The staff asked the applicant in RAI 9.1.5-2 to provide a copy of the procedures for verification by the staff.

In its response to RAI 9.1.5-2, the applicant stated that a plant inspection program for the OHLHS will be created using the manufacturer's recommendations and will meet the requirements outlined in applicable industry standards. The staff confirmed that BLN COL FSAR Section 9.1.5.4 was revised to provide additional information related to the description of implementing procedures. On the basis of its review, the staff finds the applicant adequately addressed that the OHLHS plant inspection program procedures will follow the equipment manufacturer's recommendations and will meet the requirements in applicable industry standards. With the addition to BLN COL FSAR Section 9.1.5.4 of a descriptive list of the minimum elements required to be addressed in the overhead heavy load handling equipment plant inspection program procedures, in addition to the other guidelines specified in Section 9.1.5 of NUREG-0800, the staff finds the applicant meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 4.

In the RAI response, the applicant stated that the schedule for issuing the procedures that implement the plant inspection program for the OHLHS are not yet available. The applicant also stated that implementation milestones are not expected to be available until after a detailed construction schedule has been developed, but will be provided to the NRC when available to support timely completion of inspection and audit functions. Although the response to RAI 9.1.5-2 states that the plant inspection program schedule information will be provided when available, BLN COL FSAR Table 1.8-202 lists STD COL 9.1-5 as having been completed by the applicant. The staff notes that STD COL 9.1-5 has not been fully addressed. The applicant is asked to revise BLN COL FSAR Table 1.8-202 to commit in the BLN COL FSAR to implementing the plant inspection program for the OHLHS before receipt of fuel. This is ***Open Item 9.1-4****.*

- *STD COL 9.1-6*

The applicant provided additional information in STD COL 9.1-6 to address COL Information Item 9.1-6. COL Information Item 9.1-6 states:

> *The Combined License applicant is responsible to ensure an operating radiation monitor is mounted on any crane or fuel handling machine when it is handling fuel.*

The commitment was also captured as COL Action Item 9.1.6-6 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant/holder will ensure that an operating radiation monitor is mounted on any crane or fuel handling machine when it is handling fuel.*

The NRC staff reviewed STD COL 9.1-6, which addresses COL Information Item 9.1-6 related to radiation monitoring included under Section 9.1.5 of the BLN COL FSAR. The proposed mounting of an operating radiation monitor on any crane or fuel handling machine during fuel handling is included under Section 9.1.5.3 of the BLN COL FSAR. The applicant committed to develop plant procedures that will specify that an operating radiation monitor be mounted

on any fuel handling machine when it is handling fuel. DCD Section 11.5.6.4 specifies the need to augment area radiation monitoring during fuel handling operations by a portable radiation monitor on the machine handling fuel. The staff finds that with the addition of the portable radiation monitor to any fuel handling machine when it is handling fuel, the BLN COL FSAR meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 61 for the prevention of unacceptable radiation exposure.

The staff finds that the applicant has adequately addressed COL Information Item 9.1-6 which would ensure that an operating portable radiation monitor is mounted on any crane when it is handling fuel.

Resolution of Standard Content Open Items 9.1-3 and 9.1-4

The VEGP applicant responded to ***Open Items 9.1-3 and 9.1-4*** *in a letter dated December 30, 2009. The letter proposed a change to VEGP COL FSAR Section 9.1.5.4 in response to these open items instead of revising Table 1.8-202. The applicant proposed a revision to FSAR Section 9.1.5.4 to clarify that the OHLHS, including system inspections, will be implemented prior to receipt of fuel onsite. The staff finds this acceptable since the commitment provided will ensure that the procedures will be in place and the plant inspection program will be implemented for the OHLHS prior to fuel movement. Therefore,* ***Open Items 9.1-3 and 9.1-4*** *are resolved. Incorporation of the proposed revision in the FSAR is being tracked as* ***Confirmatory Item 9.1-3****.*

Resolution of Standard Content Confirmatory Item 9.1-3

Confirmatory Item 9.1-3 is an applicant commitment to revise its FSAR Section 9.1.5.4 to include an inspection of the OHLHS prior to receipt of fuel. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 9.1-3 is now closed.

9.1.5.5 *Post Combined License Activities*

For the reasons discussed in the technical evaluation above, the following FSAR commitment is identified as the responsibility of the licensee:

- The overhead heavy-load handling program, including system inspections, will be implemented prior to receipt of fuel onsite.

9.1.5.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to OHLHS and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidelines given in Section 9.1.5 of NUREG-0800. The staff based its conclusion on the following:

- STD SUP 9.1-1, STD SUP 9.1-2, and STD SUP 9.1-3 are acceptable because the staff finds that the applicant provided supplemental information in accordance with NUREG-0612, NUREG-0800 Section 9.1.5, and Regulatory Guide (RG) 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)," Section C.I.9.1.5 guidance to describe the program and schedule for the implementation of the program governing heavy-load handling.

- STD COL 9.1-5 is acceptable because the staff finds that the relevant information in the VCSNS COL FSAR provided clarification that ISI of the OHLHS is part of the plant inspection program for the OHLHS, which is implemented through procedures.

- STD COL 9.1-6 is acceptable because the staff finds that the relevant information in the VCSNS COL FSAR meets the applicable requirements of 10 CFR Part 50, Appendix A, GDC 61.

9.2 Water Systems

9.2.1 Service Water System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.2.1, "Station Service Water System (Open, Raw Water Cooling Systems)")

9.2.1.1 *Introduction*

The service water system (SWS) is a nonsafety-related system that supplies cooling water to remove heat from the nonsafety-related CCS heat exchangers in the turbine building. The SWS is arranged into two trains of components and piping. Each train includes one service water pump, one strainer, and a cooling tower cell as its heat sink. The heat sink for both trains is provided by a single cooling tower with two cells and a divided basin. Each train is capable of providing 100-percent of the required SWS flow for normal full power operation.

9.2.1.2 *Summary of Application*

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the DCD includes Section 9.2.1.

In addition, in VCSNS COL FSAR Section 9.2.1, the applicant provided the following:

Supplemental Information

- VCS SUP 9.2-3

The applicant provided supplemental information in Section 9.2.1.2.2, "Component Description," by adding additional text to address the SWS cooling tower potential interactions.

9.2.1.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

Although the SWS (including heat sink) is not safety-related, it supports the normal (defense-in-depth) capability of removing reactor and spent fuel decay heat, it is part of the first line of defense for reducing challenges to passive safety systems in the event of transients and plant upsets, and its cooling function is important for reducing shutdown risk when the reactor coolant system (RCS) is open (e.g., during mid-loop conditions). The risk importance of the SWS makes it subject to regulatory treatment of nonsafety-related systems (RTNSS) in accordance with the Commission's policy for passive reactor plant designs in SECY-94-084, "Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems in Passive Plant Designs."

The NRC staff's evaluation of the SWS focuses primarily on confirming that the SWS is capable of performing its defense-in-depth and RTNSS functions; that it will not adversely impact safety-related structures, systems and components (SSCs); and that inspections, tests, analyses, and acceptance criteria (ITAAC), test program specifications, and RTNSS availability controls for the SWS are appropriate.

The regulatory basis for acceptance of VCS SUP 9.2-3, addressing the SWS cooling tower is the acceptance criteria in Sections 9.2.1 and 9.2.5 of NUREG-0800.

9.2.1.4 *Technical Evaluation*

The NRC staff reviewed Section 9.2.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the SWS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Supplemental Information

- VCS SUP 9.2-3

The applicant provided supplemental information in VCSNS COL FSAR Section 9.2.1.2.2 by adding additional text to address the SWS cooling tower potential interactions.

The cooling capability of the SWS mechanical draft cooling towers for the VCSNS units can be adversely affected by interactions that exist between the two SWS mechanical draft cooling towers between units. In addition, interactions between cooling towers (circulating water system (CWS) verses SWS) may adversely affect the cooling capacity of the SWS. Since VCSNS is utilizing mechanical induced-draft towers for the CWS verses natural draft cooling towers as submitted by other COL applicants, interactions between the SWS cooling towers is now more likely due to the difference in height of the discharge plume. Adverse interactions can occur due to localized atmospheric influences caused by siting considerations, the locations of major structures, the locations of the mechanical draft cooling towers, mechanical draft cooling tower fan speed, and wind effects. Because the AP1000 utilizes only one SWS mechanical draft cooling tower in its design, interaction effects between the mechanical draft cooling towers of multi-unit sites was not evaluated by the staff for AP1000. Therefore, the staff requested in

RAI 9.2.1-1 that the applicant revise VCSNS COL FSAR Section 9.2.1 to address potential adverse interactions between the VCSNS mechanical draft SWS cooling towers and the mechanical draft CWS cooling towers for the two VCSNS units. Based on its response dated February 18, 2009, the applicant addressed cooling tower interaction considerations. The applicant indicated that greater than 800 feet of separation will exist between the SWS cooling towers of adjacent units and that the large turbine building structure is located between these two cooling towers. The applicant also indicated that greater than 1300 feet of separation will exist between the units' SWS cooling towers and the two mechanical induced-draft cooling towers for the CWS. In addition, based on the buoyant effects of the warm stack exhaust air with a velocity of greater than 16 miles per hour, dispersing of the plume from the CWS cooling towers at elevations greater than the intakes of the SWS cooling tower, and winds from the east-southeast to south-southeast only occurring 1 percent of the time, significant interactions are unlikely to occur.

The applicant stated that the VCSNS COL FSAR will be revised to state that the SWS cooling towers were evaluated for potential impacts from interference and air restriction effect due to yard equipment layout and tower operation in an adjacent unit and no adverse impacts were determined. The staff confirmed that the FSAR was updated to include this statement. Based on this FSAR change and the information that was provided in the response to RAI 9.2.1-1, the staff finds the applicant's resolution of this issue to be acceptable since the SWS cooling tower interactions have been adequately addressed by at least 800 feet of building separation and the large structure, the turbine building, being placed between the two SWS cooling towers. There is a minimal probability that a cooling tower plume will interact such that a significant degradation in performance would occur.

9.2.1.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

9.2.1.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to SWS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidelines given in Sections 9.2.1 and 9.2.5 of NUREG-0800. The staff based its conclusion on the following:

- VCS SUP 9.2-3 is acceptable because the design of the SWS cooling towers meets the guidance in Sections 9.2.1 and 9.2.5 of NUREG-0800, regarding adverse interactions between the SWS cooling towers on the VCSNS site.

9.2.2 Component Cooling Water System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.2.2, "Cooling System for Reactor Auxiliaries (Closed Cooling Water Systems")

9.2.2.1 *Introduction*

The CCS is a nonsafety-related, closed loop cooling system that transfers heat from various plant components to the SWS during normal phases of operation. It removes heat from various components needed for plant operation and removes core decay heat and sensible heat for normal reactor shutdown and cooldown.

The CCS is arranged into two trains of components and piping. Each train includes one component cooling water pump and one component cooling water heat exchanger with the two trains taking suction from a single return header. The CCS includes a single surge tank, which accommodates thermal expansion and contraction. Component cooling water is distributed to the components by a single supply/return header with components being grouped in branch lines according to plant arrangement, with one branch line cooling the components inside containment. Loads inside containment are remotely isolated in response to a safety injection signal, which also trips the reactor coolant pumps (RCPs).

The CCS pumps are within the scope of AP1000 Design Reliability Assurance Program (D-RAP) as described in AP1000 DCD Table 17.4-1, "Risk Significant SSCs within the Scope of D-RAP," since these pumps provide cooling for the normal residual heat removal system (RNS) and SFP heat exchangers. In addition, CCS is discussed in AP1000 DCD Table 16.3-2, "Investment Protection Short-Term Availability Controls," for Modes 5 and 6 to support RNS cooling with the RCS open (SER Section 2.3).

9.2.2.2 *Summary of Application*

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the DCD includes Section 9.2.2. The ASE with confirmatory items for Section 9.2.2 was based on VCSNS COL FSAR, Revision 2 and DCD, Revision 17. After submitting VCSNS COL FSAR, Revision 2, the applicant revised a COL information item (COL VCS DEP 2.0-2) that affected this section. This revised COL information item has been incorporated into VCSNS COL FSAR, Revision 4 and the resolution of the confirmatory item associated with this revision is discussed below.

In addition, in VCSNS COL FSAR Section 9.2.2, and in VCSNS COL Part 7, "Departures and Exemptions, the applicant provided the following:

Tier 1 and Tier 2 Departure

The applicant proposed the following Tier 1 and Tier 2 departure from the AP1000 DCD:

- VCS DEP 2.0-2

The Tier 1 departure request is from a site parameter value provided in AP1000 DCD Tier 1, Table 5.0-1 for the maximum safety wet-bulb (noncoincident) air temperature, which is 30.06°C (86.1°F). The Tier 2 departure request is because this site parameter value is also listed as the maximum safety wet-bulb (noncoincident) air temperature in AP1000 DCD Tier 2, Table 2-1.

In VCSNS COL FSAR Section 9.2.2.1, the applicant stated that the first bulleted item in the criteria for normal operation in AP1000 DCD Section 9.2.2.1.2.1 would be replaced with the following information:

> The component cooling water supply temperature to plant components is not more than 100°F assuming a 100-year return estimate of 2-hour duration wet bulb temperature of 87.3°F for service water cooling (per Table 2.0-201).

In addition, the applicant proposed to add the following to VCSNS COL FSAR Section 9.2.2.1 in a letter dated June 30, 2010:

> The most limiting component cooled by the CCS, the RCP motor cooling system, has been designed to operate for at least 6 hours continually with cooling water supplied at temperatures up to 100°F.
>
> The performance of the standard AP1000 CCS and SWS for single cooling water train, full power operation at a maximum safety wet bulb temperature of 87.4°F has demonstrated the highest CCS temperature achieved at these conditions is 97.4°F, for a period of less than 2 hours. As ambient wet bulb temperature decreases, the CCS temperature follows and will return to below 95°F with ambient wet bulb temperature slightly lower than 84°F, assuming nominal performance of both the CCS and SWS. Since the definition of the maximum normal wet bulb temperature value is the seasonal 1% exceedance value observed at the site, the annual total operating time for which CCS temperatures could exceed 95°F is less than 30 hours per year, for periods of a few hours at most. The maximum CCS temperature of 97.3°F is bounded by the maximum allowable cooling water temperature for Reactor Coolant Pumps (the most limiting component) and the increase in maximum safety wet bulb temperature is therefore acceptable on this basis.

The exemption request related to the AP1000 DCD maximum safety wet-bulb (noncoincident) air temperature involves an exemption to 10 CFR Part 52, Appendix D, Section IV.A.2.d. Specifically, the VCSNS applicant requested an exemption from a site parameter value provided in AP1000 DCD Tier 1, Table 5.0-1 for the maximum safety wet-bulb (noncoincident) air temperature. The exemption request is evaluated in Section 2.0.4 of this SER.

9.2.2.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

While the CCS is a nonsafety-related system, it supports the normal (defense-in-depth) capability of removing reactor and spent fuel decay heat, it is part of the first line of defense for reducing challenges to passive safety systems in the event of transients and plant upsets, and its cooling function is important for reducing shutdown risk when the RCS is open (e.g., mid-loop condition). The risk importance of the CCS makes it subject to RTNSS controls in accordance with the Commission's policy for passive reactor plant designs.

The staff's evaluation of the changes that are proposed focused primarily on confirming that the changes will not adversely affect safety-related SSCs or those that satisfy the criteria for RTNSS; the capability of the CCS to perform its defense-in-depth and RTNSS functions; and

the adequacy of ITAAC, test program specifications, and availability controls that have been established for the CCS.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the CCS are given in Section 9.2.2 of NUREG-0800.

9.2.2.4 *Technical Evaluation*

The NRC staff reviewed Section 9.2.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the CCS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Tier 1 and Tier 2 Departure

- VCS DEP 2.0-2

The applicant stated that the maximum safety wet-bulb (noncoincident) air temperature for the VCSNS site was recently reevaluated and increased from the standard AP1000 DCD value of 30.06 °C (86.1 °F) to 30.72 °C (87.3 °F) to reflect expected site maximum temperature conditions. This change requires an evaluation of the various plant performance requirements and commitments affected by this parameter to confirm that the performance of the plant's safety systems remains within the bounds described in the AP1000 DCD. The CCS is one system affected; therefore, the departure was reflected in Revision 2 of the VCSNS COL FSAR and in VCSNS COL Part 7. The staff's evaluation of this proposed change is also discussed in Sections 2.0, 2.3.1, 5.4, 6.2, 6.4, 9.1.3, and 9.2.7 of this SER.

The staff evaluated this departure and determined there was a lack of information to support this change to the CCS bounding temperature of 37.78 °C (100 °F). Therefore, the staff in RAI 9.2.2-1 requested additional information related to this change in the maximum safety wet-bulb (noncoincident) temperature and the overall effects to various systems including CCS and SWS.

The applicant's response to this RAI included details related to all possible system effects, which included CCS and SWS with the increase to maximum safety wet-bulb (noncoincident) air temperature. The applicant in its response stated the following:

- The calculations performed to determine the effects of the maximum safety noncoincident wet bulb temperature are bounded by calculations for the AP1000 site, Turkey Point. The applicant's maximum safety noncoincident wet bulb temperature 30.72 °C (87.3 °F) has been determined using available historical records from the site by applying standard statistical methods to compute the 100 year return temperature. The same approach was also used to determine the value of this parameter for the Turkey Point site 30.78 °C (87.4 °F). Therefore, comparisons of the results of calculations using the two values as input data are valid. Conclusions regarding the acceptability of the AP1000 design and performance areas affected by changes in

maximum safety noncoincident wet bulb temperature for the Turkey Point site also apply to this applicant.

- The limiting temperature performance for the CCS and SWS occurs during normal power operation, with the site ambient wet bulb temperature at its maximum safety value. The AP1000 DCD maximum safety wet bulb temperature is defined as the annual "0% exceedence" value measured at or calculated for the site. It is based on the maximum observed wet bulb temperature value reached at the site, excluding periods less than 2 hours duration. The original AP1000 design criterion for CCS and SWS performance was that the maximum CCS supply temperature should not exceed 35 °C (95 °F) for normal plant power operation with a single train of cooling water systems in service and wet bulb temperature at the maximum safety noncoincident value. Increases in the value of the standard site maximum safety wet bulb temperature from 27.22 °C to 29.72 °C (81 °F to 85.5 °F) and finally to 30.06 °C (86.1 °F) have been made to include a larger number of candidate sites within the standard site temperature envelope for AP1000 and are reflected in the current revision of the AP1000 DCD. The most limiting component cooled by the CCS, the RCP motor cooling system, has been designed to operate for at least 6 hours continuously with cooling water supplied at temperatures up to 37.78 °C (100 °F), as a result of the increases in CCS temperature above 35 °C (95 °F) associated with the previous increases in wet bulb temperature. Each RCP is provided with four safety-related temperature sensors to monitor the stator cooling water temperature. These sensors generate a high temperature alarm when stator cooling water temperature rises above the normally expected operating range, and produce a reactor trip and RCP trip to protect the pumps if stator water temperature continues to rise beyond the trip setpoint. Operators monitor the cooling water temperature to verify that the RCPs are operating within normal temperature bounds at high ambient wet bulb conditions. Calculations for Turkey Point document the performance of the standard AP1000 CCS and SWS for single cooling water train, full power operation at the higher maximum safety wet bulb temperature of 30.78 °C (87.4 °F). The highest CCS temperature achieved at these conditions is 36.33 °C (97.4 °F), for a period of less than 2 hours, consistent with the duration of the highest ambient wet bulb temperature. The expected maximum CCS temperature will be slightly lower for this applicant, which is approximately 30.72 °C (87.3 °F) since the controlling wet bulb temperature is 30.78 °C minus 30.72 °C = 0.06 °C (87.4 °F minus 87.3 °F = 0.1 °F) lower than the comparable Turkey Point site value. As ambient wet bulb temperature decreases, the CCS temperature follows and will return to below 35 °C (95 °F) with ambient wet bulb temperature slightly lower than 28.89 °C (84 °F), assuming nominal performance of both the CCS and SWS. Since the definition of the maximum normal wet bulb temperature value is the seasonal 1 percent exceedence value observed at the site, the annual total operating time for which CCS temperatures could exceed 35 °C (95 °F) is less than 30 hours per year, for periods of a few hours at most. The maximum CCS temperature of 36.28 °C (97.3 °F) expected for this applicant is well below the maximum allowable cooling water temperature for RCPs (the most limiting component) and the increase in maximum safety wet bulb temperature for this applicant is, therefore, acceptable on this basis.

- The RTNSS function of the CCS and SWS is to remove decay heat during Mode 5 (cold shutdown) and Mode 6 (refueling) with reduced RCS inventory operations. Heat removal performance is reduced by increases in ambient wet bulb temperature that cause increases in SWS cold water temperature and CCS supply temperature. However, the total heat duty of the CCS and SWS is significantly lower during this mode

of operation, as compared to the normal power or cooldown modes, because there is essentially no sensible heat to remove from the RCS and the core decay heat level is low. Primary plant component heat loads are also very small because no RCPs are in operation. Any slight increase in ambient wet bulb temperature will not compromise the heat removal capability of the systems. The impact of an increase in the applicant's maximum safety wet bulb temperature from 30.06 °C (86.1 °F) to 30.72 °C (87.3 °F) on the RTNSS performance of the CCS and SWS is, therefore, acceptable. No changes are needed to the Investment Protection Short Term Availability Control (IPSAC) requirements for this applicant as a result of the increased value of maximum safety ambient wet bulb temperature.

- Cooldown from 176.67 °C to 51.67 °C (350 °F to 125 °F) must be accomplished within 96 hours after reactor shutdown, using both trains of RNS, CCS, and SWS. This evolution produces the peak heat duty on the cooling water systems. The wet bulb temperature for plant cooldown performance is the maximum normal noncoincident wet bulb temperature. Since the maximum normal ambient wet bulb temperature for this applicant has not changed from the standard AP1000 value 26.72 °C (80.1 °F), there is no impact on cooldown performance caused by the change, compared to the performance predicted for the AP1000 standard plant at the design maximum normal ambient wet bulb temperature.

The staff's review of the applicant's response to RAI 9.2.2-1 finds it to be acceptable. The increase of maximum safety wet-bulb (noncoincident) air temperature from 30.06 °C to 30.72 °C (86.1 °F to 87.3 °F) is seasonal and affects the CCS only during normal operations. This results in the highest CCS temperature of 36.33 °C (97.4 °F), for a period of less than 2 hours and at the most estimated to occur 30 hours per year In addition, as ambient wet bulb temperature decreases, the CCS temperature follows and will return to below 35 °C (95 °F), which is well below the normal operational temperature of the CCS in AP1000 DCD, Section 9.2.2.1.2.1, which states that the normal CCS supply temperature to plant components is not more than 37.78 °C (100 °F). Also, the most limited components cooled by CCS are the RCPs motor coolers and they have been designed to operate for at least 6 hours continually with cooling water supplied at temperatures up to 37.78 °C (100 °F). In addition, the main control room (MCR) operators monitor associated RCP motor stator temperatures and equipment protection sensors will automatically trip the RCP if temperatures exceed their trip setpoints.

Related to CCS and its ability to support defense-in-depth, RTNSS, and cooldown of the reactor using RNS, the change to the maximum safety wet-bulb (noncoincident) air temperature only affects normal operations (at power). RNS cooldown does not utilize the maximum safety wet bulb temperature but uses maximum normal wet bulb air temperature. Modes 5 and 6 heat loads are significantly lower during these modes as compared to power operations since the core decay heat level is low; therefore, any small increase in the maximum safety wet-bulb (noncoincident) air temperature of 30.06 °C to 30.72 °C (86.1 °F to 87.3 °F) will not negatively affect or compromise the heat removal capability of the CCS. In addition, Modes 5 and 6 are normally spring and fall outages, so they are not likely to occur during peak maximum safety wet bulb conditions.

In summary, the staff's evaluation determined that the change in the maximum safety wet-bulb (noncoincident) air temperature from 30.06 °C to 30.72 °C (86.1 °F to 87.3 °F) is acceptable; therefore, RAI 9.2.2-1 as it relates to CCS and SWS is considered closed. The response to this RAI includes new VCSNS COL FSAR departure text; therefore, this is being tracked as

Confirmatory Item 9.2-1 pending the applicant's issuance of a future revision to the VCSNS COL application.

Resolution of Confirmatory Item VCSNS 9.2-1

Confirmatory Item VCSNS 9.2-1 is an applicant commitment to revise its FSAR Section 9.2.2 to reflect the impact of the change in the maximum safety wet-bulb (noncoincident) air temperature. The staff verified that the VCSNS COL FSAR was appropriately revised. As a result, Confirmatory Item VCSNS 9.2-1 is now closed.

9.2.2.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

9.2.2.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to CCS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR meets the relevant acceptance criteria provided in Section 9.2.2 of NUREG-0800. The staff based its conclusion on the following:

- VCS DEP 2.0-2 is acceptable because the staff determined that the applicant's RAI response related to the increase in maximum safety wet-bulb (noncoincident) air temperature has been adequately resolved. Therefore, the staff concludes that the VCSNS CCS, as described in Section 9.2.2 of the VCSNS COL FSAR, is acceptable. In addition, the staff concludes that the exemption meets the requirements in 10 CFR Part 52 Appendix D, VIII.A.4 and is, therefore, acceptable.

9.2.3 Demineralized Water Treatment System

The demineralized water treatment system provides the required supply of reactor coolant purity water to the demineralized water transfer and storage system. This system does not perform any safety-related function or accident mitigation, and its failure would not reduce the safety of the plant.

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.2.3, "Demineralized Water Treatment System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.2.4 Demineralized Water Transfer and Storage System

The demineralized water transfer and storage system supplies demineralized water to fill the condensate storage tank and to the plant systems that demand a demineralized water supply. This system has no safety-related function other than containment isolation, and its failure does not affect the ability of safety-related systems to perform their safety-related functions.

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.2.4, "Demineralized Water Transfer and Storage System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.2.5 Potable Water System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.2.4, "Potable and Sanitary Water Systems")

9.2.5.1 *Introduction*

The potable water system (PWS) supplies clean water from the raw water system (RWS) for domestic use and human consumption. The portion of the PWS specified in the COL application is nonsafety-related and includes design provisions for controlling the release of water containing radioactive material and preventing contamination of the PWS.

9.2.5.2 *Summary of Application*

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the AP1000 DCD includes Section 9.2.5, "Potable Water System," which addresses Section 9.2.4, "Potable and Sanitary Water Systems," of NUREG-0800.

In addition, in VCSNS COL FSAR Section 9.2.5, the applicant provided the following:

AP1000 COL Information Item

- VCS COL 9.2-1

The applicant provided additional information in VCS COL 9.2-1 to address COL Information Item 9.2-1 in VCSNS COL FSAR Sections 9.2.5.2.1, "General Description," and 9.2.5.3, "System Operation," by providing information concerning the source of water for the PWS.

9.2.5.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the PWS are given in Section 9.2.4 of NUREG-0800.

The regulatory basis for the review of the COL information item is established in 10 CFR Part 50, Appendix A, GDC 60, "Control of Releases of Radioactive Materials to the Environment."

9.2.5.4 *Technical Evaluation*

The NRC staff reviewed Section 9.2.5 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the PWS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

AP1000 COL Information Item

- VCS COL 9.2-1

The applicant provided additional information in VCS COL 9.2-1 to resolve COL Information Item 9.2-1. COL Information Item 9.2-1 states:

> The Combined License applicant will address the components of the potable water system outside of the power block, including supply source required to meet design pressure and capacity requirements, specific chemical selected for use as a biocide, and any storage requirements deemed necessary. A biocide such as sodium hypochlorite is recommended. Toxic gases such as chlorine are not recommended. The impact of toxic gases on the main control room habitability is addressed in Section 6.4.

The NRC staff reviewed the information provided by the applicant to address COL Information Item 9.2-1 on the source of water for the PWS included under Sections 9.2.5.2.1, 9.2.5.3, and 9.2.12.1 of the VCSNS COL FSAR. In these sections the applicant proposes to use filtered and disinfected water from the Monticello Reservoir as the source of potable water. The applicant proposes the use of sodium hypochlorite as the biocide for the PWS, as recommended in the AP1000 DCD. The impact of toxic gases on the MCR habitability is evaluated in Section 6.4 of this SER. Equipment is provided to meet design pressure and capacity requirements of the PWS as stated in the AP1000 DCD. The staff finds this an acceptable resolution of COL Information Item 9.2-1 because the applicant has addressed the potable water supply source and the pressure and capacity requirements from the AP1000 DCD are met.

In VCSNS COL FSAR Section 9.2.5.3, the applicant states that no interconnections exist between the PWS and any potentially radioactive system or any system using water for purposes other than domestic water service. However, upon review of VCSNS COL FSAR Figure 9.2-201, "Raw Water System Flow Diagram," it appears that interconnections to other systems could exist. The staff prepared RAI 9.2.4-1 to clarify this inconsistency. The applicant provided a response to RAI 9.2.4-1 indicating that the only association the PWS has with the ancillary RWS is the offsite water treatment facility and further stated that the possibility for the PWS to become contaminated does not exist. Section 9.2.5.3 of the VCSNS COL FSAR,

Revision 0, defined the source for both filtered and disinfected water to be supplied from the waste treatment facility for potable water. However, the response to RAI 9.2.4-1 defines the source of disinfected water but does not clearly address the source of the site-specific filtered water. Therefore, the staff issued RAI 9.2.4-2 to confirm GDC 60 is met with regards to the potential for the site-specific source of filtered water to be potentially interconnected with any system using water for purposes other than domestic water service including any potentially radioactive system. The applicant responded to RAI 9.2.4-2 in a letter dated August 6, 2009. In the response the applicant confirmed that the site-specific source of filtered water is not connected to any potentially radioactive system. The applicant has updated the VCSNS COL FSAR with additional information confirming that the PWS will not become contaminated. The staff considers this RAI closed because the PWS supply is not interconnected with any potentially radioactive system and, therefore, will not become contaminated by radioactive water. Therefore, the staff finds that GDC 60 is satisfied with respect to preventing contamination of the PWS by radioactive water.

9.2.5.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

9.2.5.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to PWS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidance in Section 9.2.4 of NUREG-0800. The staff based its conclusion on the following:

- VCS COL 9.2-1 is acceptable because the applicant has provided sufficient information on the source of water for the PWS to satisfy GDC 60, with respect to preventing contamination by radioactive water.

9.2.6 Sanitary Drains (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.2.4, "Potable and Sanitary Water Systems")

9.2.6.1 *Introduction*

The portion of the sanitary drain system specified in the COL application is nonsafety-related. It collects sanitary wastes from plant restrooms and locker room facilities. The system design ensures that there is no possibility for radioactive contamination of the sanitary drains.

9.2.6.2 *Summary of Application*

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the AP1000 DCD includes Section 9.2.6, "Sanitary Drains," which addresses Section 9.2.4, "Potable and Sanitary Water Systems," of NUREG-0800.

In addition, in VCSNS COL FSAR Section 9.2.6, the applicant provided the following:

Supplemental Information

- VCS SUP 9.2-1

The applicant provided supplemental information by adding text to the end of Section 9.2.6.2.1, "General Description," to state that sanitary waste, once treated, is combined with other plant discharge streams for discharge to the Parr Reservoir.

9.2.6.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for VCS SUP 9.2-1 are given in Section 9.2.4 of NUREG-0800.

The regulatory basis for acceptance of the supplementary information is established in:

- GDC 60

9.2.6.4 *Technical Evaluation*

The NRC staff reviewed Section 9.2.6 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to sanitary drains. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Supplemental Information

- VCS SUP 9.2-1

The NRC staff reviewed the location of the waste treatment plant included under Section 9.2.6.2.1 of the VCSNS COL FSAR. In Section 9.2.6.2.1 of the VCSNS COL FSAR, the applicant proposes an onsite sewage treatment plant for the treatment of sanitary waste. Treated effluent from the sanitary waste system is discharged to the blowdown sump and eventually discharged to the Parr Reservoir. The AP1000 DCD states that there are no interconnections between the sanitary drainage system and systems having the potential for containing radioactive material, and the sanitary drainage system does not service facilities in radiologically controlled areas. Therefore, the staff finds the proposed location of the waste treatment plant acceptable as it does not affect compliance with GDC 60, with respect to preventing contamination by radioactive water.

9.2.6.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

9.2.6.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to sanitary drains, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the requirements of NRC regulations, and the acceptance criteria in NUREG-0800, Section 9.2.4. The staff based its conclusion on the following:

- VCS SUP 9.2-1 is acceptable because the applicant has provided sufficient information on the location of the waste treatment plant to satisfy GDC 60, with respect to preventing contamination by radioactive water.

9.2.7 Central Chilled Water System (Related to RG 1.206 Section C.III.1, Chapter 9, C.I.9.2.2, "Cooling System for Reactor Auxiliaries (Closed Cooling Water Systems)")

9.2.7.1 *Introduction*

The plant HVAC systems require chilled water as a cooling medium to satisfy the ambient air temperature requirements for the plant. The central chilled water system (VWS) supplies chilled water to the HVAC systems and is functional during reactor full-power and shutdown operation. The VWS provides chilled water to the cooling coils of the supply air handling units and unit coolers of the plant HVAC systems. It also supplies chilled water to the liquid radwaste system, gaseous radwaste system, secondary sampling system, and the temporary air supply units of the containment leak rate test system. The VWS is nonsafety-related (except that the containment isolation interface is safety-related).

The system consists of two closed loop subsystems: a high cooling capacity subsystem and a low cooling capacity subsystem. The high capacity chilled water subsystem (HCCWS) is the primary system used to provide chilled water to the majority of plant HVAC systems and other plant equipment requiring chilled water cooling. The low capacity chilled water subsystem (LCCWS) is dedicated to the nuclear island nonradioactive ventilation system (VBS), which includes the MCR, and the chemical and volume control system (CVS) makeup pump and normal residual heat removal pump compartment unit coolers.

The HCCWS consists of two 85-percent capacity chilled water pumps, two 15-percent capacity chilled water pumps, two 85-percent capacity water-cooled chillers, two 15-percent air-cooled chillers, a chemical feed tank, an expansion tank, and associated valves, piping, and instrumentation. The LCCWS consists of two 100-percent capacity chilled water loops. Each loop consists of a chilled water pump, an air-cooled chiller, an expansion tank, and associated valves, piping, and instrumentation.

The VWS pumps and chillers for the low capacity subsystem are within the scope of the AP1000 D-RAP as described in AP1000 DCD Table 17.4-1, "Risk Significant SSCs within the Scope of D-RAP," since these pumps and chillers provide cooling to the CVS makeup pump room. The pumps and chillers are important components of the VWS.

9.2.7.2 *Summary of Application*

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the DCD includes Section 9.2.7. The ASE with confirmatory items for Section 9.2.7 was based on VCSNS COL FSAR, Revision 2 and DCD, Revision 17. After submitting VCSNS COL FSAR, Revision 2, the applicant revised a COL information item (COL VCS DEP 2.0-2) that affected this section. This revised COL information item has been incorporated into VCSNS COL FSAR, Revision 4 and the resolution of the confirmatory item associated with this revision is discussed below.

In addition, in VCSNS COL FSAR Section 9.2, and in Part 7 of the VCSNS COL application, the applicant provided the following:

Tier 1 and Tier 2 Departure

The applicant proposed the following Tier 1 and Tier 2 departure from the AP1000 DCD:

- VCS DEP 2.0-2

The Tier 1 departure request is from a site parameter value provided in AP1000 DCD Tier 1, Table 5.0-1 for the maximum safety wet-bulb (noncoincident) air temperature, which is 30.06 °C (86.1 °F). The Tier 2 departure request is because this site parameter value is also listed as the maximum safety wet-bulb (noncoincident) air temperature in AP1000 DCD Tier 2, Table 2-1.

For Section 9.2.7, no departures and/or supplements were identified in Revision 2 of the VCSNS COL FSAR; however, based on a letter dated June 30, 2010, additional information was added by the applicant as part of VCS DEP 2.0-2, as described below:

> Add the following information at the end of the first paragraph under "Normal Operation" in DCD Subsection 9.2.7.2.4.
>
> > The increased heat load produced by operation at the higher VCSNS maximum safety ambient wet bulb temperature of 87.3°F can be accommodated within the available capacity margin of the chiller units, without impacting the LCCWS or supporting systems' design or plant operation. Cooling coil design calculations indicate that during operation at the standard plant design temperatures (115°F dry bulb, 86.1°F wet bulb), the VBS air handling unit has cooling coil and system margin.

The exemption request related to the AP1000 DCD maximum safety wet-bulb (noncoincident) air temperature involves an exemption to 10 CFR Part 52, Appendix D, Section IV.A.2.d. Specifically, the VCSNS applicant requested an exemption from a site parameter value provided in AP1000 DCD Tier 1, Table 5.0-1 for the maximum safety wet-bulb (noncoincident) air temperature. The exemption request is evaluated in Section 2.0.4 of this SER.

9.2.7.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

Although the VWS is nonsafety-related, the low-capacity subsystem provides chilled water for cooling safety-related and defense-in-depth equipment rooms. The staff's evaluation of the changes that are proposed focused primarily on confirming that the changes will not adversely affect safety-related SSCs or those that satisfy the criteria for RTNSS, the capability of the VWS to perform its RTNSS and defense-in-depth cooling functions, and the adequacy of ITAAC, test program specifications, and RTNSS availability controls that have been established for the VWS.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the CCS are given in Section 9.2.2 of NUREG-0800.

9.2.7.4 *Technical Evaluation*

The NRC staff reviewed Section 9.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the CCS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Tier 1 and Tier 2 Departure

- VCS DEP 2.0-2

The applicant stated that the maximum safety wet-bulb (noncoincident) air temperature for the VCSNS site was recently reevaluated and increased from the standard AP1000 DCD value of 30.06 °C (86.1 °F) to 30.72 °C (87.3 °F) to reflect expected site maximum temperature conditions. This change requires that an evaluation be performed for the various plant performance requirements and commitments affected by this parameter to confirm that the performance of the plant's safety systems remains within the bounds described in the AP1000 DCD. The CCS was one of those systems that were affected; therefore, the departure was reflected in Revision 2 of the VCSNS COL FSAR. The staff's evaluation of this proposed change is also discussed in Sections 2.0, 2.3.1, 5.4, 6.2, 6.4, 9.1.3, and 9.2.2 of this SER.

The staff evaluated this departure for the CCS and determined there was a lack of information to support this change to the CCS bounding temperature of 37.78 °C (100 °F). Therefore, in RAI 9.2.2-1 the staff requested additional information related to this change in the maximum safety wet-bulb (noncoincident) air temperature and the overall effects to various systems including the CCS, SWS and VWS.

The applicant's response to this RAI included details related to all possible system effects, which include the CCS, SWS, and VWS, with the increase to maximum safety wet-bulb

(noncoincident) air temperature. In its response, the applicant stated the following related to VWS.

> The nuclear island non-radioactive ventilation system (VBS) is the only HVAC system that is designed to accommodate the maximum safety temperature limits. The LCCWS also uses the maximum safety temperature limits (dry and wet bulb) as its design basis temperatures. The remainder of the HVAC systems are designed to accommodate the maximum normal temperature limits (1% exceedance values), including the HCCWS.
>
> The VBS maintains the safety-related heat sink temperatures and is designed with two 100% capacity subsystems. The VBS is served by the LCCWS exclusively. The LCCWS also serves the RNS and CVS pump room coolers. The nominal refrigeration capacity of each of the air-cooled chillers used in the LCCWS is 322 tons (3.864 Mbtu/hr) at an ambient dry bulb temperature of 46.11°C (115°F).
>
> Calculation assesses the impact of changes in both maximum safety and maximum normal ambient wet bulb temperature on the design and performance of the HCCWS and LCCWS. The calculation note was prepared to evaluate the impacts of increases in both maximum safety and maximum normal non-coincident ambient wet bulb temperature values for the Turkey Point site. It assumes that maximum ambient wet bulb temperature increases to 30.78°C (87.4°F) and maximum normal ambient wet bulb temperature increases to 27.5°C (81.5°F). The VC Summer maximum safety wet bulb temperature increase to 30.72°C (87.3°F) is bounded by the value assumed for Turkey Point; therefore, the results documented bound the effects of this change on the VC Summer plants.
>
> The increased heat load produced by operation at the higher VC Summer maximum safety ambient wet bulb temperature of 30.72°C (87.3°F) can be accommodated within the available capacity margin of the chiller units, without impacting the LCCWS or supporting systems' design or plant operation. Cooling coil design calculations indicate that during operation at the standard plant design temperatures 46.11°C (115°F) dry bulb, 30.06°C (86.1°F) wet bulb, the VBS air handling unit has cooling coil and system margin.
>
> At the VC Summer site design temperatures of 44.44°C (112°F) dry bulb, 30.72°C (87.3°F) wet bulb, the off coil temperatures for VBS do not change, based on the results of supplier coil performance calculations. Therefore, the MCR temperature and humidity at the higher VC Summer site outside air wet bulb temperature will remain at or below their desired design points during normal operation.
>
> The VC Summer site maximum normal temperature has not been increased from the AP1000 standard value of 26.72°C (80.1°F). Therefore, any conclusions regarding changes needed as a result of increasing the maximum normal ambient wet bulb value do not apply to VC Summer.
>
> No changes are needed in the AP1000 LCCWS design. Since these chillers are also air-cooled, their performance is not affected by changes in wet bulb

temperature. Therefore, the existing, standard air-cooled chillers and the associated VBS both perform acceptably at the increased VC Summer site maximum safety ambient wet bulb temperature of 30.72°C (87.3°F).

The staff finds the applicant's response to RAI 9.2.2-1 acceptable. The increase of maximum safety wet-bulb (noncoincident) air temperature from 30.06 °C to 30.72 °C (86.1 °F to 87.3 °F) is seasonal (short duration per year) and only affects the LCCWS air cooled chillers. Based on an audit of HVAC calculations, the original chiller size based on the previous design wet bulb air temperature resulted in a required rating of 164 tons (1.97 million British thermal units/hour (Mbtu/hr)). The revised calculated value including the revised wet bulb air temperature resulted in a required rating of 182 tons (2.184 Mbtu/hr). Based on calculations, no modifications are required to the exiting specified chiller tonnage since the nominal refrigeration capacity of each of the LCCWS is 322 tons (3.864 Mbtu/hr) at an ambient dry bulb air temperature of 46.11 °C (115 °F); therefore, adequate margin is still maintained. Also, the MCR temperature and humidity at the higher VCSNS site outside air wet bulb temperature will remain at or below their desired design points during normal operation. In addition, the VBS air handling unit has a cooling coil and system margin.

As previously stated, the LCCWS is within the scope of the AP1000 D-RAP since these pumps and chillers provide cooling to the CVS makeup pump room. The pumps and chillers are important components of the VWS. The increase in the maximum safety wet-bulb (noncoincident) air temperature of 30.06 °C to 30.72 °C (86.1 °F to 87.3 °F) will not negatively affect or compromise the heat removal capability of the VWS since adequate margin remains between the capacity of each chiller and the calculated heat load.

In summary, the staff's evaluation determined that the change in the maximum safety wet-bulb (noncoincident) air temperature from 30.06 °C to 30.72 °C (86.1 °F to 87.3 °F) is acceptable; therefore, RAI 9.2.2-1 as it relates to VWS is considered closed. The response to this RAI includes new VCSNS COL FSAR departure text; therefore, this is being tracked as **Confirmatory Item 9.2-2** pending the applicant's issuance of a future revision to the VCSNS COL FSAR.

Resolution of Confirmatory Item VCSNS 9.2-2

Confirmatory Item VCSNS 9.2-2 is an applicant commitment to revise FSAR Section 9.2.7 to reflect the impact of the change in the maximum safety wet-bulb (noncoincident) air temperature. The staff verified that the VCSNS COL FSAR was appropriately revised. As a result, Confirmatory Item VCSNS 9.2-2 is now closed.

9.2.7.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

9.2.7.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the VWS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the acceptance criteria in NUREG-0800, Section 9.2.2. The staff based its conclusion on the following:

- VCS DEP 2.0-2 is acceptable because the staff determined that the applicant's RAI response related to the increase in maximum safety wet-bulb (noncoincident) air temperature has been adequately resolved. Therefore, the staff concludes that the VCSNS VWS is acceptable.

9.2.8 Turbine Building Closed Cooling Water System

9.2.8.1 *Introduction*

The turbine building closed cooling water system (TCS) is a nonsafety-related system that provides closed-loop cooling for the removal of heat from heat exchangers in the turbine building and rejects the heat to either the CWS or the RWS. The system consists of two 100-percent capacity pumps, three 50-percent capacity heat exchangers (connected in parallel), one surge tank, one chemical addition tank, and associated piping, valves, controls, and instrumentation. Backwashable strainers are provided upstream of each TCS heat exchanger. System piping is made of carbon steel, except that nonmetallic piping may be used in accordance with ASME B31.1 if justified by evaluation.

9.2.8.2 *Summary of Application*

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the DCD includes Section 9.2.8.

In addition, in VCSNS COL FSAR Section 9.2.8, the applicant provided the following:

Site-Specific Information Replacing Conceptual Design Information

- VCS CDI

The applicant provided additional information to replace conceptual design information (CDI) in the AP1000 DCD with information indentifying the source of cooling water for the VCSNS TCS heat exchangers.

9.2.8.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the TCS are given in Section 9.2.2 of NUREG-0800.

9.2.8.4 *Technical Evaluation*

The NRC staff reviewed Section 9.2.8 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed

that the information in the application and incorporated by reference addresses the required information relating to the TCS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Site-Specific Information Replacing Conceptual Design Information

- VCS CDI

The AP1000 standard plant allows the use of either circulating water or raw water for removing heat from the TCS heat exchangers. The AP1000 DCD leaves it up to the COL applicant to specify a specific source of cooling water for plant-specific applications. The VCSNS design specifies the use of both circulating water and raw water for this purpose. This arrangement was reviewed and approved by the NRC during its evaluation of the AP1000 DCD. Consequently, the VCSNS design is consistent with the AP1000 licensing basis as approved by the staff, which includes conformance with NUREG-0800 Section 9.2.2 (as applicable). Therefore, the supplementary design information that was provided for the VCSNS TCS is acceptable.

9.2.8.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

9.2.8.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to TCS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the acceptance criteria given in Section 9.2.2 of NUREG-0800. The staff based its conclusion on the following:

- VCS CDI is acceptable because the design of the TCS meets the guidance in Section 9.2.2 of NUREG-0800, with respect to the source of cooling water for the removing heat from the TCS heat exchangers.

9.2.9 Waste Water System (Related to RG 1.206 Section C.III.1, Chapter 9, C.I.9.3.3, "Equipment and Floor Drainage System"

9.2.9.1 *Introduction*

The portion of the waste water system (WWS) specified in the COL application is nonsafety-related. The system collects and processes the waste water from the equipment and floor drains in the nonradioactive building areas during plant operations and outages. The waste water from the turbine building sumps flows to a waste water retention basin, if required,

for settling of suspended solids and treatment before discharge. The waste water retention basin transfer pumps discharge the basin effluent to the blowdown sump prior to discharge to the Parr Reservoir via the plant outfall piping. The design of the system precludes inadvertent discharge of radioactively contaminated drainage.

9.2.9.2 *Summary of Application*

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.2 of the AP1000 DCD, Revision 19. Section 9.2 of the AP1000 DCD includes Section 9.2.9, "Waste Water System," which addresses Section 9.3.3, "Equipment and Floor Drainage System," of NUREG-0800.

In addition, in VCSNS COL FSAR Section 9.2, the applicant provided the following:

AP1000 COL Information Item

- VCS COL 9.2-2

The applicant provided additional information in VCS COL 9.2-2 to address COL Information Item 9.2-2, by including additional design information to the waste water retention basin portion of AP1000 DCD Section 9.2.9.2.2.

9.2.9.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the WWS are given in Section 9.3.3 of NUREG-0800.

The regulatory basis for acceptance of the COL information item is established in:

- GDC 4
- GDC 60

9.2.9.4 *Technical Evaluation*

The NRC staff reviewed Section 9.2.9 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the WWS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

AP1000 COL Information Item

- VCS COL 9.2-2

The applicant provided additional information in VCS COL 9.2-2 to resolve COL Information Item 9.2-2. COL Information Item 9.2-2 states:

> The Combined License applicant will address the final design and configuration of the plant waste water retention basins and associated discharge piping, including piping design pressure, basin transfer pump size, basin size, and location of the retention basins.

The NRC staff reviewed the resolution to VCS COL 9.2-2 with respect to the design of the plant waste water retention basin (WWRB) and associated components included under Section 9.2.9.2.2, "Component Description" of the VCSNS COL FSAR. To address VCS COL 9.2-2, details were provided for the location of the WWRB and routing configuration.

The waste water from the WWRB is discharged to the Parr Reservoir through a blowdown sump with inputs from the WWRB, CWS cooling tower blowdown and sanitary waste effluent. The method for forwarding the waste water from the basin to the blowdown sump is by use of two transfer pumps.

In order to meet GDC 60, the applicant must demonstrate suitable control of the release of radioactive materials in liquid effluent. Upon review of VCS COL 9.2-2, the staff requested the applicant, in RAI 9.3.3-1, to provide a discussion on whether all site-specific potentially radioactive fluid draining into and downstream of the water basin will be monitored prior to disposition or provide a justification for not providing radiation monitoring. The staff also requested that the applicant provide the additional details of the associated components (i.e., transfer pumps, size of basin, etc.) as requested in the COL item.

The applicant responded to RAI 9.3.3-1 in a letter dated April 27, 2010. The response provided detailed information on radiation monitoring, level instrumentation and components for the WWS. Each unit's WWRB is divided into two separate compartments, which allows one compartment to be out of service while the other compartment is available. Each WWRB is constructed using formed concrete and is a lined basin constructed such that its contents, dissolved or suspended, do not penetrate the liner and leach into the ground. The configuration and sizing of the WWRB is to allow settling of solids larger than 10 microns that may be suspended in the waste water stream. The applicant confirmed that the potentially contaminated fluids entering the WWRB from the turbine building sumps are monitored with a radiation monitor on the common discharge piping. As indicated in the RAI response, there are several effluent lines within the scope of the certified design that bypass this radiation monitor. These include the diesel fuel area sumps, SWS cooling tower blowdown, SWS strainer blowdown, and CWS strainer backwash. The RAI response clarifies that these lines do not come in contact with radioactive sources or contain radiation monitoring prior to discharge into the WWRB. The applicant indicated that for VCSNS Units 2 and 3, there are no site–specific systems that deliver influent streams to the WWRB outside of those associated with the certified design. Waste water can also be sampled prior to discharge from the WWRB.

Two 100 percent capacity transfer pumps send waste water from the WWRB to a blowdown sump. The transfer pumps are sized to meet the maximum expected influent flow. The normal pump discharge flowpath is to the blowdown sump, but flow can also be directed to the alternate unit's WWRB.

The blowdown sump is a concrete structure and is open to the atmosphere. The blowdown sump, common to both VCSNS Units 2 and 3, receives input from the WWRB and mixes with high volume CWS stream. The RWS provides water for dilution of liquid radwaste when the CWS blowdown is not sufficient or available for that purpose. As discussed in VCSNS COL FSAR Section 9.2.11.4, the RWS does not have the potential to be a flow path for radioactive fluids. The blowdown sump also receives sanitary waste effluent from the sanitary drainage system (SDS) and there are no interconnections between this system and systems with the potential for containing radioactive material.

The effluent then flows from the blowdown sump to the outfall structure, and then finally to the Parr Reservoir. A branch line from the liquid radwaste system (WLS) discharges to plant outfall piping downstream of the blowdown sump at a dilution point. The liquid radwaste is monitored and sampled for radiation and is addressed in detail in FSAR Section 11.2.

Based on the content in VCSNS COL FSAR Section 9.2.9 and the RAI 9.3.3-1 response, the staff concludes that the design of the WWS complies with GDC 60, with respect to control of radiation release to environment because as discussed above, the WWS does not normally interact with any potential radioactive sources and any influent streams with the potential to become contaminated are monitored.

To protect against flooding, level instrumentation is provided at the WWRB and controls are provided for automatic or manual operation of the transfer pumps based on the level of the WWRB. A level transmitter located in each WWRB pump sump provides an alarm signal in the MCR when the sump level(s) reach predetermined set points. Each unit's WWRB is located in the yard area outside of each unit's respective Turbine Building.

Waste water and blowdown effluent from the blowdown sump drains by gravity to the Parr Reservoir via the plant outfall piping. The outfall pipe is sized with adequate capacity to gravity drain the blowdown sump at the highest anticipated influent flow rate. Therefore, no level instrumentation is provided at the blowdown sump. Based on the content in VCSNS COL FSAR Section 9.2.9 and the RAI 9.3.3-1 response, the staff concludes that the design of the WWS complies with GDC 4, with respect to flood protection because the WWRB are designed with two 100-percent pumps controlling level by use of WWRB level instrumentation.

Based on the information provided in VCSNS COL FSAR Section 9.2.9 and in the response to RAI 9.3.3-1, the staff finds that the applicant has adequately addressed COL information item VCS COL 9.2-2. The staff finds that GDC 4 is met based on the WWS arrangement to prevent flooding that could affect safety-related SSCs adversely and GDC 60 is met based on the requirements for controlling the release of radioactive materials by preventing the inadvertent transfer of contaminated fluids to system portions for noncontaminated drainage. Therefore, RAI 9.3.3-1 is closed and incorporation of the proposed markup into a future revision of the VCSNS COL FSAR is identified as **Confirmatory Item 9.2-3**.

Resolution of Confirmatory Item VCSNS 9.2-3

Confirmatory Item VCSNS 9.2-3 is an applicant commitment to revise FSAR Section 9.2.9.2.2 to provide additional detail regarding the WWRB. The staff verified that the VCSNS COL FSAR was appropriately revised. As a result, Confirmatory Item VCSNS 9.2-3 is now closed.

9.2.9.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

9.2.9.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the WWS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidelines given in Section 9.3.3 of NUREG-0800. The staff based its conclusion on the following:

- VCS COL 9.2-2 is acceptable because the staff finds that the relevant information in the VCSNS COL FSAR meets the applicable requirements of GDC 4 and GDC 60.

9.2.10 Hot Water Heating System

The hot water heating system is a nonsafety-related system that supplies heated water to selected nonsafety-related air handling units and unit heater in the plant during cold weather operation, and to the containment recirculation fan coil units during plant outages in cold weather.

Section 9.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.2.10 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.2.11 Raw Water System

9.2.11.1 *Introduction*

The RWS is a nonsafety-related system that pumps water from the Monticello Reservoir for use by the VCSNS units. The SWS cooling tower basins rely upon makeup from the RWS in order to achieve and maintain cold shutdown conditions.

The RWS supplies raw (untreated) water for makeup to the CWS mechanical draft cooling tower basins. In addition, the untreated water is used for an alternate makeup for the SWS cooling

tower basins via a cross tie, cooling for the TCS and condenser vacuum pump seal water heat exchangers, and is utilized for diluting radwaste. In addition, the ancillary RWS provides filtered water from the water treatment facility for normal makeup to the SWS cooling tower basins, the demineralizer water treatment system (DTS), and the fire protection system (FPS). The RWS is shared by the two VCSNS units.

9.2.11.2 *Summary of Application*

Section 9.2.11 of the VCSNS COL FSAR, Revision 5, provides information concerning the RWS design basis, system description, system operation, safety evaluation, tests and inspections, and instrumentation. The RWS was referred to in the AP1000 DCD in relation to the CWS, SWS, DTS, and FPS, but an RWS section was not included in the AP1000 DCD for the NRC staff to evaluate.

In addition, AP1000 DCD Table 1.7-2, "AP1000 System Designators and System Diagrams," indicates that the RWS is "wholly out of scope." The RWS is needed in order to operate the VCSNS units and consequently, the applicant has provided a complete description of this system in the VCSNS COL FSAR for the VCSNS units.

In VCSNS COL FSAR Section 9.2.11, the applicant provided the following:

Interface Requirements

The plant interfaces for the RWS are identified in Table 1.8-203 of the VCSNS COL FSAR as Item 9.4, "Plant makeup water quality limits," and Item 9.5, "Requirements for location and arrangement of raw and sanitary water systems." These items are identified as "non-nuclear safety (NNS)" interfaces.

Supplemental Information

- VCS SUP 9.2-2

The applicant provided supplemental information by adding the new Section 9.2.11 after AP1000 DCD Section 9.2.10.

9.2.11.3 *Regulatory Basis*

Because the RWS was not considered within the scope of the AP1000 DCD, a regulatory basis for this system was not established for the standard plant design. The regulatory basis of the RWS for the VCSNS units is provided in this section.

The acceptance criteria that pertain to CWS and RWS evaluations are given in NUREG-0800, Sections 10.4.5, "Circulating Water System"; 9.2.1, "Station Service Water System"; 9.2.5, "Ultimate Heat Sink"; 3.4.1, "Flood Protection"; and 3.5, "Barrier Design for Missile Protection."

The regulatory bases and guidance for acceptance of the supplemental information and interface items are established in:

- GDC 2, "Design Basis for Protection Against Natural Phenomena"
- GDC 4

- 10 CFR 20.1406, “Minimization of Contamination”
- RG 1.29, “Seismic Design Classification,” Position C2

9.2.11.4 *Technical Evaluation*

The staff reviewed the information provided in Section 9.2.11 of the VCSNS COL FSAR that describes the RWS for the VCSNS units, including the information provided by Figure 9.2-201, “Raw Water System Flow Diagram.” The staff’s evaluation in this section focuses primarily on RWS failure considerations and on the capability and reliability of the RWS to perform its cooldown function. The results of the NRC staff’s evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The remainder of this SER section evaluates both VCS SUP 9.2-2 and Interface Items 9.4 and 9.5.

A. GDC 2, GDC 4, and RG 1.29

The staff reviewed the information in VCSNS COL FSAR Section 9.2.11 to confirm that RWS failures will not adversely affect SSCs that are safety-related or designated for RTNSS, impact the control room, or result in excessive radiological releases to the environment. Although VCSNS COL FSAR Section 9.2.11.1.1, “Safety Design Basis,” states that failures of the RWS or its components will not affect the ability of safety-related systems to perform their intended functions, it did not include sufficient information to adequately describe the consequences of RWS failures and to explain why safety-related SSCs are not affected. Likewise, it did not include sufficient information to explain why a failure of the RWS will not adversely affect RTNSS systems and components or impact the control room, or result in an unacceptable release of radioactive material to the environment. Because the applicant did not identify and address these considerations, the staff was unable to confirm compliance with GDC 2, GDC 4, and passive plant policy considerations, as described in SECY-94-084. Consequently, the staff requested in RAI 9.2.1-2 that the applicant revise VCSNS COL FSAR Section 9.2.11 to address the impact of RWS failures, including development of plant-specific ITAAC and test program specifications, as appropriate.

In a letter dated March 4, 2009, the applicant provided a detailed response to the GDC 2, GDC 4, and ITAAC and testing questions. In its response, the applicant stated that the potential failures of the RWS and the corresponding impact on SSCs that are safety-related or AP1000 equipment Class D were considered. A summary of the applicant’s response is described below.

- The RWS does not directly interface with any safety-related system as described in VCSNS COL FSAR Section 9.2.11 and shown on VCSNS COL FSAR Figure 9.2-201. The piping is routed underground from the RWS intake structure to the points of interface for RWS. The significant above ground portions of the RWS are at the RWS intake structure and at the CWS cooling tower basins. Underground branch lines provide alternate dilution flow to the CWS blowdown piping. This piping is not routed in close proximity to any safety-related SSCs. The only RTNSS system that RWS is in close proximity to is the SWS. A potential flooding from a break in the RWS piping is bounded by the analysis for a break in the CWS piping. AP1000 DCD Section 3.4.1.1.1, “Protection from External Flooding,” indicates that a failure of the CWS cooling tower, the SWS piping, or the CWS piping could result in a potential flood source. However, these potential sources are not located in close proximity to safety-related structures and

the consequences of a failure in the yard would be enveloped by the analysis described in DCD Section 10.4.5, "Circulating Water System," for failure of the CWS. Site grading will carry water away from safety-related or AP1000 Class D SSCs.

- Short runs of RWS piping are routed outside in the yard area and inside the turbine building to the RWS interface points. The primary source of flooding would be from the RWS water that discharges through the break prior to securing the RWS pumps. A break in the RWS is bounded by a break in the CWS piping. As discussed in AP1000 DCD Section 3.4.1.2.2.3, "Adjacent Structures Flooding Event," the bounding flooding source inside the Turbine Building is a break in the CWS piping. Flow from any postulated pipe failures above DCD elevation 100'-0" (VCSNS Units 2 and 3 equivalent plant NAVD88 elevation is 400'-0") would travel down to DCD elevation 100'-0" via floor gratings and stairwells. There is no safety-related equipment in the turbine building. The CCS and SWS components on DCD elevation 100'-0", which provide RTNSS support for the normal RNS are expected to remain functional following a flooding event in the turbine building since the pump motors and valve operators are above the expected flood level. Therefore, failures of the RWS piping within the turbine building will not adversely impact any safety-related or RTNSS SSCs.

- The RWS-to-SWS interface is at the SWS makeup control valve V009, as shown in AP1000 DCD Figure 9.2.1-1, "Service Water System Piping and Instrumentation Diagram." The SWS piping is routed from the control valve V009 to the top of the SWS cooling tower basin. There is an air gap between the SWS cooling tower basin water level and the discharge into the basin. The air gap ensures any break upstream of the raw water makeup control valve will not result in the draining of the SWS cooling tower basin.

- The RWS is not safety-related and its failure does not lead to the failure of any safety-related systems.

The applicant's response to RAI 9.2.1-2 provided adequate details for most of the information requested. However, the staff could not determine if the flooding discussion in the RAI response included the ancillary RWS and water treatment facility. In RAI 9.2.1-6, the staff requested clarifications to what is inside the "black box" of Figure 9.2-201. Specifically, major equipment such as tanks, strainers, screens and pumps, piping arrangement and flow distribution needed to be shown and described in VCSNS COL FSAR Section 9.2.11.

In its response, the applicant stated that the "black box" is an offsite water treatment facility that will provide pretreated (filtered) and domestic (drinking) water. The applicant stated that the offsite water facility is shown on VCSNS COL FSAR Figure 1.1-202, "VCSNS Site Plan," and Figure 9.2-201 for the purpose of information only and this will be revised in a future revision of the FSAR with a note stating that the offsite water treatment facility is not within the scope of the COL application. The applicant also stated that portions of the RWS referred to as "ancillary RWS" are normally supplied with filtered water from the offsite water treatment facility. In addition, the offsite water treatment facility does not present flooding concerns to VCSNS Units 2 and 3, since the facility is located more than a mile away from these units, and based on site drainage characteristics, flooding is not a concern.

The staff finds the applicant's response to RAI 9.2.1-6 addressed the staff's concerns since it clarifies the ancillary RWS as portions of the RWS that is supplied from the offsite water treatment facility. The staff verified the VCSNS COL FSAR changes discussed in the RAI

response have been incorporated into the FSAR. In addition, the staff determined that the plant flooding from the water treatment facility is not an issue since this facility is more than a mile away from the power plant.

In summary, the staff determined that failure of the RWS will not affect the ability of any safety-related system to perform its intended safety function nor will it adversely affect any RTNSS systems. Postulated breaks in the RWS piping will not impact safety-related components because the RWS is not located in the vicinity of any safety-related equipment, and water from a postulated pipe break will not reach any safety-related equipment or result in injury to occupants of the control room nor will it result in a release of radioactivity to the environment. A break in the RWS is bounded by a break in the CWS piping as discussed in AP1000 DCD Section 3.4.1.2.2.3, which is the flooding source of concern inside the turbine building. Testing of the RWS has been properly addressed. Since the RWS is not safety-related and its failure does not lead to the failure of any safety-related systems, the staff has concluded that the requirements of GDC 2, GDC 4 and RG 1.29 have been satisfied; therefore, RAI 9.2.1-2 and RAI 9.2.1-6 are closed. The staff confirmed that the VCSNS COL FSAR has been updated to include the FSAR revisions proposed in the applicant's responses to RAI 9.2.1-2 and RAI 9.2.1-6.

The staff has evaluated the RWS intake structure described in VCSNS COL FSAR Section 9.2.11.2.2, “Component Description,” and concluded that the failure of the intake structure would not impact the ability of safety-related systems to perform their intended functions.

B. Cold Shutdown

The RWS is relied upon for achieving and maintaining cold shutdown conditions, which is necessary for satisfying the technical specifications. In particular, the RWS is relied upon for cooling the RCS from Mode 4 to Mode 5 conditions within 36 hours. The staff found that VCSNS COL FSAR Section 9.2.11 did not provide a clearly defined design basis with respect to the RWS cooldown function, and the reliability and capability of the RWS to perform this function for the most limiting situations were not described and addressed in this regard. For example, the minimum RWS flow rate, water inventory, temperature limitations, and corresponding bases for providing SWS makeup for the two VCSNS units were not described. Also, the suitability of RWS materials for the plant-specific application and measures being implemented to resolve vulnerabilities and degradation mechanisms to assure RWS functionality over time were not addressed. Because the applicant did not adequately define and address RWS design-bases considerations with respect to its cooldown function, the staff was unable to confirm that the cooldown and policy considerations that apply to passive plant designs, as discussed in SECY-94-084, were satisfied. Consequently, the staff requested in RAI 9.2.1-3 that the applicant revise VCSNS COL FSAR Section 9.2.11 accordingly, and to address the design basis regarding the reliability and capability of the RWS cooldown function.

In its response, the applicant stated that the following was related to achieving and maintaining cold shutdown conditions:

- As described in VCSNS COL FSAR Section 9.1.11, and shown on VCSNS COL FSAR Figure 9.2-201, the RWS interfaces with the SWS. As noted in the response to RAI 9.2.1-2, the other functions performed by the RWS do not have a direct interface with any system, other than the SWS, identified in the AP1000 DCD, which is safety-related, designated for RTNSS, or designated as AP1000 Class D.

- The RWS provides a water fill/makeup function for the SWS. The SWS has investment protection short-term availability controls as described in AP1000 DCD Table 16.3-2, which are applicable in Mode 5 with the RCS pressure boundary open and in Mode 6 with the upper internals in place or cavity level less than full. Under these conditions, the SWS is directly providing active core cooling and was evaluated by Westinghouse and determined to meet the RTNSS criteria as documented in NUREG-1793 and in Westinghouse Commercial Atomic Power (WCAP)-15985, "AP1000 Implementation of the Regulatory Treatment of Non-safety-Related System Process." Unlike the SWS, the RWS does not directly provide core cooling and was evaluated in WCAP-15985. It was determined to not meet the RTNSS criteria and does not require investment protection short-term availability controls.

- It is unlikely that a failure of the RWS to provide adequate makeup flow to the SWS cooling tower basins would occur during the short time period in which SWS is performing an RTNSS function as described above. However, if a failure were to occur in the RWS, the remaining available inventory in the service water cooling tower basins and the stored water, which is available in the additional excess volume of the secondary fire water tank would provide ample time (more than 24 hours) to restore the RWS makeup flow or take the procedural actions necessary to exit the conditions for RTNSS applicability. Therefore, the RWS is not required to be an RTNSS system or subject to investment protection short-term availability controls. The RWS is designed to be a highly reliable system capable of operating during a loss of normal alternating current (ac) power to provide the RWS makeup flow under normal and abnormal conditions. Procedural controls, which provide for continued operation of the RWS or reestablishment of operations under off-normal conditions, will be included in operating procedures, where appropriate.

- As described in AP1000 DCD Section 5.4.7.1.2.1, "Shutdown Heat Removal," the RNS in conjunction with its associated support systems, the RCS and SWS (as a support system for CCS), are used for shutdown heat removal. The RWS provides indirect support for this function by providing a source of makeup water to the SWS cooling tower basins to compensate for evaporation, drift, and blowdown.

- The RWS provides this makeup water to support the cooling requirements for the SWS. During a normal plant cooldown, the RNS and CCS reduce the temperature of the RCS from approximately 177 °C (350 °F) to approximately 52 °C (125 °F) within 96 hours after shutdown. Each unit's RWS is designed to provide ample makeup flow to the SWS during these conditions using the RWS pumps.

- If cooldown to cold shutdown (Mode 5) is required within 36 hours to comply with a limiting condition for operation (LCO) in accordance with the Technical Specifications, heat will be transferred from the RCS via the steam generators to the main steam system for a longer period of time, allowing the RNS to be placed in service at a lower temperature with lower decay heat levels. Because of the reduced RNS heat removal requirements associated with this cold shutdown sequence, the required RWS makeup flow to the SWS cooling towers is less than normal cooldown requirements.

- An ample inventory of raw water is available to provide makeup to the SWS cooling tower basins. As noted in VCSNS COL FSAR Section 2.4.1.2.2, "Lakes and Reservoirs," the Monticello Reservoir (the source for the RWS) has a useable storage

volume of over 4.93 E8 cubic meters (400,000 acre-feet), and has sufficient capacity to support cooldown to cold shutdown conditions and maintain the station in Mode 5 for greater than 7 days.

- It was stated that the RWS piping and structures are designed and constructed in accordance with nationally recognized Codes and standards (such as ASME/ANSI B31.1, "Power Piping," and the America Water Works Association (AWWA). Design features have been included such as the use of buried piping made of material not susceptible to corrosion, heat tracing, redundant pumps and alternate power supplies to ensure that the RWS is reliable and will be available to support normal plant operation and shutdown functions. The underground RWS piping will be high-density polyethylene (HDPE), which is not susceptible to corrosion. Therefore, periodic inspections of the underground RWS piping are not required.

- The RWS is highly reliable based on its design, and a single failure of a structure or component in the RWS would not affect normal plant cooldown. Each RWS pump can deliver makeup flow to the SWS cooling tower basins to meet demand during all modes of operation. Failure of an operating pump, discharge valve or traveling screen would not prevent the RWS from providing makeup to the SWS cooling towers. In the event of a loss of normal ac power, two of the three 50 percent capacity RWS pumps may be manually loaded onto the appropriate diesel bus and may be manually started by the operator. The RWS continues to maintain the capability to provide makeup water to the SWS cooling tower basins during the loss of normal ac power events.

- In the unlikely event that all RWS flow to the SWS cooling towers is lost, there is ample time to identify and correct the situation or to align alternate sources of water to provide that makeup flow, and the RWS is shown to not be an RTNSS system nor subject to investment protection short-term availability controls. It is also important to note that not any of the RNS, CCS, SWS, or RWS is required to establish and maintain the AP1000 plant in a safe shutdown condition, since passive safety-related systems perform that function. This is explicitly recognized throughout the AP1000 DCD and NUREG-1793.

- As noted in VCSNS COL FSAR Section 14.3.2.3.3, "Other Site-Specific Systems," this site-specific RWS does not meet the ITAAC selection criteria. ITAAC screening was performed for the RWS using the screening criteria of VCSNS COL FSAR Section 14.3.2.3, which concluded that ITAAC is not applicable as indicated in VCSNS COL FSAR Table 14.3-201.

- No specific Technical Specifications are required for the RWS and none are applicable. Technical Specifications for the AP1000 are discussed in VCSNS COL FSAR Chapter 16 and AP1000 DCD Chapter 16, and were evaluated by the NRC in Chapter 16 of NUREG-1793.

- There are no availability controls for the RWS and they are not required based on the RTNSS evaluation discussed in Chapter 22 of NUREG-1793 and WCAP-15985, Revision 2. Also, VCSNS COL FSAR Chapter 16 and AP1000 DCD Chapter 16 do not identify any availability requirements for the RWS.

The staff reviewed the RAI 9.2.1-3 response and determined that the response was partially acceptable. The staff determined that the RWS is designed with the provision of single failure since many of the RWS components can be supplied with backup power from the onsite diesel

generators as necessary. During a loss of station power, the RWS make-up to the SWS is not required for 12 hours due to existing cooling tower basin inventory. After 12 hours, onsite make-up capacity from the fire protection storage tank is available for more than an additional 12 hours. In addition, the RWS is considered highly reliable and able to supply required water for the SWS for greater than 7 days due to the volume of water available in the reservoir. However, the response did not adequately answer the questions related to the ancillary RWS, testing of the water treatment facility, and piping Codes. In RAI 9.2.1-7, the staff requested that the applicant provide more details concerning the ancillary RWS to be included in the VCSNS COL FSAR, a description of the type of testing planned for the water treatment facility, and information in the VCSNS COL FSAR concerning Codes and standards (i.e., ASME B31.1, AWWA, and International Building Code (IBC)) for the RWS. RAI 9.2.1-3 is considered partially resolved (see RAI 9.2.1-7).

In its response to RAI 9.2.1-7, the applicant stated that ancillary RWS loads are each under 3785 liters/min (1000 gallons per minute (gpm)) with piping sized accordingly, consisting only of the piping intended to supply water from the offsite facility to various loads, in accordance with VCSNS COL FSAR Figure 9.2-201. Related to testing, the applicant stated that AP1000 DCD Section 14.2.9.2.6, "Service Water System Testing," includes testing of the SWS cooling tower water level and controls. The SWS testing will verify the capability of the level control system, and thus the availability of water from the RWS; therefore, no additional testing description is required in the AP1000 DCD and VCSNS COL FSAR. Concerning Codes and standards compliance, the applicant responded that AP1000 DCD Table 3.2-3, "AP1000 Classification of Mechanical and Fluid System, Components, and Equipment," indicates that the RWS is a Class E system. AP1000 DCD Section 3.2.2.7, "Other Equipment Classes," indicates that Class E is used for nonsafety-related SSCs that do not have specialized industry standards or classification. Therefore, it is consistent to not include the standards used for the RWS design and construction within the scope of the FSAR.

The staff finds the applicant's response to RAI 9.2.1-7 partly acceptable since the response explained the 'ancillary' RWS and provided acceptable pump flow rates and testing requirements, which includes the level control system and ensures proper operations of the RWS; however, the applicant did not fully address all of the staff's concerns and did not provide an FSAR markup of the materials and piping Codes to be utilized consistent with the RAI response.

The applicant provided a follow-up RAI response dated October 16, 2009, to address the staff's concerns and provided information that will be added to a future revision of the VCSNS COL FSAR that will state that the RWS piping is designed to ASME Standard B31.1. The staff reviewed the applicant's more recent response and finds that the response to RAI 9.2.1-7 (along with RAI 9.2.1-3) are acceptable since the referenced correct piping Code for this system has been defined in VCSNS COL FSAR Section 9.2.11.2.2. The staff confirmed that the VEGP COL FSAR has been updated to include the FSAR revisions proposed in the applicant's responses to RAI 9.2.1-3 and RAI 9.2.1-7.

RWS is designed to be a highly reliable system capable of operating during a loss of normal ac power to provide RWS makeup flow under normal and abnormal conditions to support cold shutdown conditions for up to 7 days. However the staff was unable to determine how the components perform during a loss of offsite power (LOOP) event. Therefore, in RAI 9.2.1-8, the staff requested that the applicant provide a description of backup electrical power to the water treatment facility, screenwash, and traveling screens to demonstrate that the RWS is highly

reliable. The staff also requested that the applicant provide a detailed description on the effects of the water treatment facility during a LOOP.

In its response to RAI 9.2.1-8, the applicant stated that the offsite water treatment facility is not designed to function during a LOOP. The two raw water pumps are provided with diesel backed power in accordance with VCSNS COL FSAR Section 9.2.11.3. The pump discharge valves are powered from the same source as the pumps, and the SWS cooling tower level can be manually controlled, independent of instrument air or electric power. The applicant noted that no additional powered components are necessary to provide the RWS flow to the SWS for cooling tower makeup. Each of the three raw water intakes are designed for supplying half of the makeup required for the circulating water cooling towers and have through-trash-rack and through-screen-mesh velocity less than 0.5 feet per second at minimum reservoir water level. The SWS makeup requirements are less than 10 percent of the RWS design flow rate. These extremely low velocities (less than 0.05 feet per second) would not draw and retain trash on the screens and trash rack. However, traveling screens and screen wash equipment are powered from an associated diesel-backed bus even though not required for the SWS cooling tower makeup.

The staff finds that the applicant's response to RAI 9.2.1-8 is acceptable since it adequately addresses backup power, which was available to key components permitting the RWS to operate during a LOOP to support the SWS for cold shutdown. The staff finds that the RWS is designed with the provision of a single failure since two of the RWS pumps can be supplied with backup power from the onsite diesel generators to provide adequate makeup flow to the SWS cooling tower basins. It was noted that each RWS pump can deliver makeup flow to the SWS cooling tower basins to meet demand during all modes of operation. Further, without the RWS makeup to the SWS cooling tower basins, adequate inventory in the SWS cooling tower basins exists along with the stored water in the secondary fire water tanks that would provide more than 24 hours to restore RWS makeup flow. In addition, the RWS is considered highly reliable based on its design, and a single failure of a structure or component in the RWS would not affect normal plant cooldown.

C. Regulatory Treatment of Non-Safety-Related System

The RWS supports the SWS cooling function by providing makeup water to the SWS cooling tower basins. The staff noted that while the SWS is designated for RTNSS during reduced reactor inventory conditions, the RWS is not needed to support the SWS cooling function when the reactor water inventory is reduced because the RWS is not designated for RTNSS. However, there is no explanation in VCSNS COL FSAR Section 9.2.11 as to why the RWS is not considered RTNSS. Also, because the SWS cooling tower basins are very limited in their capacity, it is not clear why the RWS makeup is not required for this situation. Consequently, in RAI 9.2.1-4, the staff requested that the applicant revise VCSNS COL FSAR Section 9.2.11 to explain why the RWS makeup is not needed during reduced reactor inventory conditions and, in particular, describe the controls that will be implemented to ensure that assumptions remain valid.

In its response dated March 4, 2009, the applicant stated that a detailed response was provided in RAI 9.2.1-3, explaining why the RWS is not designated as RTNSS and makeup from the RWS to the SWS cooling tower basins is not required during reduced reactor inventory conditions. The referenced RAI response also discusses that procedural control will be established to take the required actions to exit the conditions for applicability of the SWS as a RTNSS system, in the unlikely event of a failure to reestablish the RWS makeup capability.

Plant documentation, in the form of the system description for the RWS, will include the information addressed in these RAI responses.

The staff finds the applicant's response to RAI 9.2.1-4 acceptable since: 1) the RWS was previously evaluated in WCAP-15985 in Table 1-1, "Nonsafety-related system evaluation in AP1000 RTNSS Process," which was previously approved by the staff; 2) the RWS does not directly provide core cooling; and 3) the RWS has adequate stored water within the SWS cooling towers and the fire water tank for more than 24 hours to support the SWS RTNSS functions, plus the 24 hours stored onsite water supply provides ample time to restore the RWS makeup flow or take the procedural actions necessary to exit the condition of applicability for the SWS and its RTNSS function. Therefore, RAI 9.2.1-4 is closed.

D. System Design Consideration

As specified by 10 CFR 20.1406, COL applicants are required to describe how facility design and procedures for operation will minimize the generation of radioactive waste and contamination of the facility and environment, and facilitate eventual plant decommissioning. Although the RWS has no interconnections with any systems that contain radioactive fluids, industry experience has shown that this alone may not be sufficient to prevent the RWS from becoming contaminated. For example, unplanned leaks or release of contaminated fluids as a result of component failures or transport, drainage problems in contaminated areas, and the migration of contamination through soils and other porous barriers over time have caused systems and areas of the plant that are not directly connected with contaminated systems to become contaminated. Therefore, in RAI 9.2.1-5, the staff requested that the applicant provide additional information to describe design provisions and other measures that will be implemented to satisfy the requirements specified by 10 CFR 20.1406, including measures that will be implemented to monitor the RWS for contamination and corrective actions that will be taken to eliminate any radioactive contamination that is identified. In its response, dated March 4, 2009, and from information in the response to RAI 9.2.1-2, it was noted that although the RWS provides an alternate dilution source for liquid radwaste discharge when the CWS cooling tower blowdown source is not available, the RWS does not have the potential to be a flow path for radioactive fluids via their system interfaces. This is because the WLS effluent discharges by gravity, to a point in the CWS blowdown piping (which leads to the plant outfall) at a lower elevation than the RWS interface with the CWS. Therefore, the staff finds it unlikely that liquid radwaste would be able to travel up the CWS piping to the RWS interface. In addition, the applicant indicated that the groundwater monitoring program should minimize the possibility of contaminating the RWS from external subsurface sources. The applicant noted that the groundwater monitoring program is described in VCSNS COL FSAR Section 12AA.5.4.13, "Ground Monitoring Program." The staff's evaluation of the groundwater monitoring program is provided in Chapter 12 of this SER. Because there is no interconnection with any system that contains potentially radioactive fluids as indicated in VCSNS COL FSAR Section 9.2.11.1.1, the staff concludes that the requirements of 10 CFR 20.1406 are satisfied and considers this aspect of RAI 9.2.1-5 closed.

Related to fire protection system interface, an offsite water treatment facility located near the Monticello Reservoir supplies filtered and chemically treated raw water to the fire water storage tanks via the ancillary RWS subsystem. Water quality is further ensured by the applicant in VCSNS COL FSAR Section 9.2.11.2.1, "General Description," which states that provisions are included to inject chemicals into the raw water pump discharge piping to maintain a noncorrosive, nonscale-forming condition and limit biological fouling. The above provisions satisfy RG 1.189, "Fire Protection for Nuclear Power Plants," Revision 1, related to the

prevention and control of biofouling or microbiologically induced corrosion in the fire water piping system.

Based on the above technical evaluation, the NRC staff finds acceptable the information added to the VCSNS COL FSAR to address VCS SUP 9.2-2 and Interface Items 9.4 and 9.5.

9.2.11.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

9.2.11.6 *Conclusion*

The NRC staff has evaluated the RWS as described in VCSNS COL FSAR Section 9.2.11. The staff's evaluation focused primarily on confirming that: (a) the design of the RWS complies with the requirements of GDC 2 and GDC 4 and conforms with the guidance in RG 1.29; (b) the RWS reliance for the support of SWS for achieving and maintaining cold shutdown conditions and RTNSS considerations is consistent with the guidance in SECY-94-084; (c) the RWS is not considered RTNSS; (d) other system design considerations meet the requirements of 10 CFR 20.1406; and (e) the interaction with the FPS has been properly evaluated.

Based upon the results of this evaluation, the staff concludes that the VCSNS RWS, as described under VCS SUP 9.2-2 in Section 9.2.11 of the VCSNS COL FSAR, is acceptable.

9.3 Process Auxiliaries

9.3.1 Compressed and Instrument Air System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.3.1, "Compressed Air Systems")

9.3.1.1 *Introduction*

The compressed and instrument air system delivers instrument air, service air, and high-pressure air. The instrument air subsystem provides high quality instrument air for plant use. The service air subsystem supplies plant breathing air. The high-pressure air subsystem produces air for high-pressure applications.

9.3.1.2 *Summary of Application*

Section 9.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.3 of the AP1000 DCD, Revision 19. Section 9.3 of the AP1000 DCD includes Section 9.3.1.

In addition, in VCSNS COL FSAR Section 9.3, the applicant provided the following:

AP1000 COL Information Item

- STD COL 9.3-1

The applicant provided additional information in STD COL 9.3-1 to address COL Information Item 9.3-1 (COL Action Item 9.3.1-1).

9.3.1.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the compressed and instrument air system are given in Section 9.3.1 of NUREG-0800.

The regulatory basis for STD COL 9.3-1 addressing Generic Safety Issue (GSI) 43, "Reliability of Air Systems," as part of training and procedures include the following:

- GDC 1, "Quality Standards and Records," as it relates to the reliability of safety-related equipment actuated or controlled by compressed air.

9.3.1.4 *Technical Evaluation*

The NRC staff reviewed Section 9.3.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the compressed and instrument air system. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside of the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 9.3.1.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 9.3-1 (COL Action Item 9.3.1-1), involving air systems (NUREG-0933, "Resolution of Generic Safety Issues," Issue 43)*

The NRC staff reviewed STD COL 9.3-1 related to COL Information Item 9.3-1. COL Information Item 9.3-1 states:

> *The Combined License applicant will address DCD 1.9.4.2.3, Issue 43 as part of training and procedures identified in section 13.5.*

The commitment was also captured as COL Action Item 9.3.1-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will address NUREG-0933, Issue 43 as part of training and procedures.*

The applicant proposed to resolve STD COL 9.3-1 by providing training and procedures for operations and maintenance of the instrument air subsystem and air operated valves. The methodology to develop system operating procedures, abnormal operating procedures, and alarm response procedures is reviewed in Section 13.5 of this SER. The training program for operators and maintenance personnel is reviewed in Section 13.2 of this SER. The applicant also stated that the compressed and instrument air system will be maintained and tested in accordance with the manufacturers' recommendations and procedures and that the system will be periodically tested to demonstrate conformance with the quality requirements of ANSI/ISA-7.3-1981.

NUREG-0933, Issue 43 discusses that possible solutions for this issue, include better operator training, operator awareness of the importance of compress air systems, and periodic testing and inspection of the compressed air systems. The NRC staff reviewed the applicant's proposed resolution to STD COL 9.3-1 and determined that the BLN COL FSAR meets the guidance in NUREG-0933, Issue 43; therefore, the staff finds STD COL 9.3-1 resolved.

9.3.1.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

9.3.1.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to compressed and instrument air system, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidelines given in Section 9.3.1 of NUREG-0800.

- STD COL 9.3-1, the staff evaluated Issue 43, "Reliability of Air Systems," as part of the training and procedures in accordance with the requirements of GDC 1, as it relates to the impact of a failure of the compressed and instrument air system on safety-related SSCs. Based on the results of this evaluation, the VCSNS COL FSAR meets the guidance in NUREG-0933, Issue 43 and is acceptable.

9.3.2 Plant Gas System (Related to RG 1.206 Section C.III.1, Chapter 9, C.I.9.3.1, "Compressed Air Systems")

The plant gas system is a nonsafety-related system that supplies hydrogen, carbon dioxide, and nitrogen gasses to plant systems as required. Failure of the system does not compromise any safety-related system nor does it prevent safe reactor shutdown.

Section 9.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.3.2, "Plant Gas System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.3.3 Primary Sampling System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.3.2, "Process and Postaccident Sampling Systems")

The primary sampling system is used to collect samples during normal operations and following an accident. The system collects for analysis samples from the reactor coolant, auxiliary primary process streams, and containment atmosphere. Both the normal operation and post accident requirements are carried out by this single system.

Section 9.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.3.3, "Primary Sampling System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.3.4 Secondary Sampling System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.3.2, "Process and Postaccident Sampling Systems")

The secondary sampling system delivers representative samples of fluids from secondary systems to sample analyzer packages. Continuous online secondary chemistry monitoring detects impurity ingress and provides early diagnosis of system chemistry excursions in the plant.

Section 9.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.3.4, "Secondary Sampling System," of Revision 19 of the

AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.3.5 Equipment and Floor Drainage Systems (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.3.3, "Equipment and Floor Drainage System")

The equipment and floor drainage system collects liquid wastes from equipment and floor drains during normal operation, startup, shutdown, and refueling. The equipment and floor drainage system consists of two subsystems, radioactive waste drains and nonradioactive waste drains.

Section 9.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.3.5, "Equipment and Floor Drainage Systems," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.3.6 Chemical and Volume Control System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.3.4, "Chemical and Volume Control System (PWR) Including Boron Recovery System")

The CVS maintains the required water inventory and quality in the RCS, provides pressurizer auxiliary spray, controls the boron neutron absorber concentration in the reactor coolant, provides a means for filling and pressure testing the RCS, controls the primary water chemistry and reduces coolant radioactivity level. Further, the system provides recycled coolant for demineralized water makeup for normal operation and provides borated makeup flow to the RCS in the event of some accidents, such as a small break loss-of-coolant accident.

Section 9.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.3.6, "Chemical and Volume Control System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.4 Air-Conditioning, Heating, Cooling, and Ventilation Systems

9.4.1 Nuclear Island Nonradioactive Ventilation System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.4.1, "Control Room Area Ventilation System")

9.4.1.1 *Introduction*

The VBS, in conjunction with the MCR emergency habitability system described in Section 6.4, provides a controlled environment for the comfort and safety of control room personnel and assures the operability of control room and nearby components during normal operating, anticipated operational transient, and design-basis accident conditions.

9.4.1.2 *Summary of Application*

Section 9.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.4 of the AP1000 DCD, Revision 19. Section 9.4 of the DCD includes Section 9.4.1, describing the VBS.

In addition, in VCSNS COL FSAR Sections 9.4.1.4 and 9.4.12, the applicant provided the following:

AP1000 COL Information Items

- STD COL 9.4-1a

The applicant provided additional information in STD COL 9.4-1a to address the first part of COL Information Item 9.4-1 (COL Action Item 9.4.1-1), related to a program for inspections and testing applicable to the VBS.

In addition, in VCSNS COL FSAR Section 9.4.12, the applicant provided the following:

- VCS COL 9.4-1b

The applicant provided additional information in VCS COL 9.4-1b to address the second part of COL Information Item 9.4-1 (COL Action Item 6.4-3). The local toxic gas services are evaluated to determine the need for monitoring for control room habitability.

9.4.1.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the VBS are given in Section 9.4.1 of NUREG-0800.

The applicable regulatory guidance for the VBS is as follows:

- RG 1.140, "Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants," Revision 2

9.4.1.4 *Technical Evaluation*

The NRC staff reviewed Section 9.4.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the VBS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in

evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 9.4.1.4 of the VEGP SER:

AP1000 COL Information Items

- *STD COL 9.4-1a*

The applicant provided additional information in STD COL 9.4-1a to resolve COL Information Item 9.4-1. COL Information Item 9.4-1a states:

> *The Combined License applicants referencing the AP1000 certified design will implement a program to maintain compliance with ASME AG-1, ASME N509, ASME N510 and Regulatory Guide 1.140 for portions of the nuclear island nonradioactive ventilation system and the containment air filtration system identified in subsection 9.4.1 and 9.4.7.*

The commitment was also captured as COL Action Item 9.4.1-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will develop a program to maintain operability of the nuclear island nonradioactive ventilation system and the containment air filtration system.*

The NRC staff reviewed STD COL 9.4-1a related to COL Action Item 9.4-1 included under Section 9.4.1.4 of the BLN COL FSAR. The NRC staff reviewed the resolution to STD COL 9.4-1a on the proposed implementation of a program to maintain compliance with industry standards and RGs for the VBS included under Section 9.4.1.4 and Section 9.4.12 of the BLN COL FSAR, and concludes

that this item has been resolved for the VBS because the applicant has referenced the applicable regulatory guide and industry standards.

Correction of Error in the Standard Content Evaluation Text

The NRC staff identified an error in the text reproduced above from Section 9.4.1.4 of the BLN SER that requires correction. The BLN SER includes the following statement: "The NRC staff reviewed STD COL 9.4-1a related to COL Action Item 9.4-1 included under Section 9.4.1.4 of the BLN COL FSAR." COL Action Item 9.4-1 does not exist and should be replaced with COL Information Item 9.4-1.

- VCS COL 9.4-1b

The applicant provided additional information in VCS COL 9.4-1b to resolve the second part of COL Information Item 9.4-1. The second part of COL Information Item 9.4-1 states:

> The Combined License applicant will also provide a description of the [Main Control Room/Technical Support Center] MCR/TSC HVAC subsystem's recirculation mode during toxic emergencies, and how the subsystem equipment isolates and operates, as applicable, consistent with the toxic issues, including conformance with Regulatory Guide 1.78 to be addressed by the Combined License applicant as discussed in DCD subsection 6.4.7.

The commitment was also captured as COL Action Item 6.4-3 in Appendix F of NUREG-1793, which states:

> The COL applicant will determine the amount and location of possible sources of toxic chemicals in or near the plant and for seismic Category I Class 1E toxic gas monitoring, using methods discussed in RG 1.78.

The commitment was also captured as COL Action Item 9.4.1-1 in Appendix F of NUREG-1793, which states:

> The COL applicant will develop a program to maintain operability of the nuclear island nonradioactive ventilation system and the containment air filtration system.

The NRC staff review of VCS COL 9.4-1b is addressed in Section 6.4 of this SER.

9.4.1.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

9.4.1.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the VBS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The applicant has provided sufficient information for satisfying Section 9.4.1 of NUREG-0800 and RG 1.140 related to the applicable inspection and testing standards. This addresses STD COL 9.4-1a for VBS.

Conclusions regarding VCS COL 9.4-1b are discussed in Section 6.4 of this SER.

9.4.2 Annex/Auxiliary Buildings Nonradioactive HVAC System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.4.3, "Auxiliary and Radwaste Area Ventilation System")

The annex/auxiliary building nonradioactive HVAC system maintains ventilation, permits personnel access, and controls the concentration of airborne radioactive material in the nonradioactive personnel and equipment areas, electrical equipment rooms, clean corridors, the ancillary diesel generator room and demineralized water deoxygenating room in the annex building, and the main steam isolation valve compartments, reactor trip switchgear rooms, and piping and electrical penetration areas.

Section 9.4.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.4.2, "Annex/Auxiliary Buildings Nonradioactive HVAC System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.4.3 Radiologically Controlled Area Ventilation System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.4.2, "Spent Fuel Pool Area Ventilation System," and C.I.9.4.3, "Auxiliary and Radwaste Area Ventilation System")

The radiologically controlled area ventilation system maintains ventilation, permits personnel access, and controls the concentration of airborne radioactive material in the fuel handling area, the radiologically controlled areas of the auxiliary and annex buildings.

Section 9.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.4.3, "Radiologically Controlled Area Ventilation System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.4.4 Balance-of-Plant Interface

This section is not applicable to AP1000.

9.4.5 Engineered Safety Features Ventilation System

This section is not applicable to AP1000.

9.4.6 Containment Recirculation Cooling System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.4.5, "Engineered Safety Feature Ventilation System")

The containment recirculation cooling system provides a suitable and controlled environment for the containment building during normal plant operation and shutdown.

Section 9.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.4.6, "Containment Recirculation Cooling System", of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.4.7 Containment Air Filtration System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.4.5, "Engineered Safety Feature Ventilation System")

9.4.7.1 *Introduction*

The containment air filtration system (VFS) serves no safety function, except containment isolation. The system conditions and filters outside air for the containment, the fuel handling area and the other radiologically controlled areas of the auxiliary and annex buildings, except for the hot machine shop and health physics areas, which are served by a separate ventilation system.

9.4.7.2 *Summary of Application*

Section 9.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.4 of the AP1000 DCD, Revision 19. Section 9.4 of the DCD includes Section 9.4.7, "Containment Air Filtration System," which addresses Section 9.4.5, "Engineered Safety Feature Ventilation System," of NUREG-0800.

In addition, in VCSNS COL FSAR Section 9.4.7.4, the applicant provided the following:

AP1000 COL Information Item

- STD COL 9.4-1a

The applicant provided additional information in STD COL 9.4-1a to address COL Information Item 9.4-1 related to a program for inspections and testing applicable to the VFS included under Section 9.4.7.4 of the VCSNS COL FSAR.

9.4.7.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the VFS are given in Section 9.4.5 of NUREG-0800.

The applicable regulatory guidance for the VFS is as follows:

- RG 1.140

9.4.7.4 *Technical Evaluation*

The NRC staff reviewed Section 9.4.7 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the VFS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 9.4.7.4 of the VEGP SER:

> *AP1000 COL Information Item*
>
> - *STD COL 9.4-1a*
>
> *The applicant provided additional information in STD COL 9.4-1a to resolve COL Information Item 9.4-1. COL Information Item 9.4-1 states:*
>
> > *The Combined License applicants referencing the AP1000 certified design will implement a program to maintain compliance with ASME AG-1, ASME N509, ASME N510, and Regulatory Guide 1.140 for portions of the nuclear island nonradioactive*

ventilation system and the containment air filtration system identified in subsection 9.4.1 and 9.4.7. The Combined License applicant will also provide a description of the MCR/TSC HVAC subsystem's recirculation mode during toxic emergencies, and how the subsystem equipment isolates and operates, as applicable, consistent with the toxic issues, including conformance with Regulatory Guide 1.78, to be addressed by the Combined License applicant as discussed in DCD subsection 6.4.7.

The commitment was also captured as COL Action Item 9.4.1-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

The COL applicant will develop a program to maintain operability of the nuclear island nonradioactive ventilation system and the containment air filtration system.

The NRC staff reviewed STD COL 9.4-1a related to COL Action Item 9.4-1 included under Section 9.4.7.4 of the BLN COL FSAR.

The NRC staff reviewed the resolution to STD COL 9.4-1a on the proposed implementation of a program to maintain compliance with industry standards and RGs for the VFS included under Section 9.4.7.4 of the BLN COL FSAR, and concludes that this item has been resolved for the VFS because the applicant has appropriately referenced the applicable regulatory guide and industry standards.

Correction of Error in the Standard Content Evaluation Text

The NRC staff identified an error in the text reproduced above from Section 9.4.7.4 of the BLN SER that requires correction. The BLN SER includes the following statement: "The NRC staff reviewed STD COL 9.4-1a related to COL Action Item 9.4-1 included under Section 9.4.7.4 of the BLN COL FSAR." COL Action Item 9.4-1 does not exist and should be replaced with COL Information Item 9.4-1.

9.4.7.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

9.4.7.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the VFS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In conclusion, the applicant has provided sufficient information for satisfying Section 9.4.7 of NUREG-0800 and RG 1.140 related to the applicable inspection and testing standards. This addresses STD COL 9.4-1a for the VFS.

9.4.8 Radwaste Building HVAC System

The radwaste building HVAC system serves the radwaste building, which includes the clean electrical/mechanical equipment room and the potentially contaminated HVAC equipment room, the packaged waste storage room, the waste accumulation room, and the mobile systems facility.

Section 9.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.4.8, "Radwaste Building HVAC System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.4.9 Turbine Building Ventilation System

The turbine building ventilation system operates during startup, shutdown, and normal plant operations. The system maintains acceptable air temperatures in the turbine building for equipment operation and for personnel working in the building.

Section 9.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.4.9, "Turbine Building Ventilation System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.4.10 Diesel Generator Building Heating and Ventilation System

The diesel generator building heating and ventilation system serves the standby diesel generator rooms, electrical equipment service modules, and diesel fuel oil day tank vaults in the diesel generator building and the two diesel oil transfer modules located in the yard near the fuel oil storage tanks. Local area heating and ventilation equipment is used to condition the air to the stairwell and security room.

Section 9.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.4.10, "Diesel Generator Building Heating and Ventilation System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.4.11 Health Physics and Hot Machine Shop HVAC System

The health physics and hot machine shop HVAC system serves the annex building stairwell, S02; the personnel decontamination area, frisking and monitoring facilities, containment access

corridor, and health physics facilities on the 100′-0″ elevation of the annex building and the hot machine shop on the 107′-2″ elevation of the annex building.

Section 9.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.4.11, "Health Physics and Hot Machine Shop HVAC System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.5 Other Auxiliary Systems

9.5.1 Fire Protection System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.5.1, Fire Protection Program)

9.5.1.1 *Introduction*

The FPS provides assurance, through a defense-in-depth philosophy, that the Commission's fire protection objectives are satisfied. These objectives are: 1) to prevent fires from starting; 2) to detect rapidly, control, and extinguish promptly those fires that do occur; and 3) to provide protection for SSCs important to safety so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant. In addition, FPSs must be designed such that their failure or inadvertent operation does not adversely impact the ability of the SSCs important to safety to perform their safety functions. These objectives are stated in NUREG-0800, Section 9.5.1, "Fire Protection Program," and are indentified as the Fire Protection Program goals and objectives in RG 1.189.

9.5.1.2 *Summary of Application*

Section 9.5 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.5 of the AP1000 DCD, Revision 19. Section 9.5 of the AP1000 DCD includes Section 9.5.1.

In addition, in VCSNS COL FSAR Section 9.5.1, the applicant provided the following:

Tier 2 Departure

- VCS DEP 18.8-1

The applicant provided this departure from the AP1000 DCD to address the relocation of the Operations Support Center (OSC). This departure is evaluated in this SER section and in Section 13.3 of this SER.

AP1000 COL Information Items

- STD COL 9.5-1 and STD COL 9.5-3

The applicant provided additional information in STD COL 9.5-1 and STD COL 9.5-3 to resolve COL Information Items 9.5-1 and 9.5-3 (COL Action Item 9.5.1-1(a) through 9.5.1-1(o)) by establishing the site-specific implementation of the fire protection program, including the organization, responsibility, qualification, and training for fire protection program personnel and

fire brigade members in Section 9.1.5.8, “Fire Protection Program,” and in Appendix 9A of the VCSNS COL FSAR.

- STD COL 9.5-4

The applicant provided additional information in STD COL 9.5-4 to resolve COL Information Item 9.5-4 (COL Action Item 9.5.1-5) by establishing Table 9.5-201, “AP1000 Fire Protection Program Compliance with BTP CMEB 9.5-1,” and Table 9.5-202, “Exceptions to NFPA Standard Requirements,” of the VCSNS COL FSAR.

- STD COL 9.5-8

The applicant provided additional information in STD COL 9.5-8 to resolve COL Information Item 9.5-8 (COL Action Item 9.5.1-3) by establishing an administrative control procedure to address fire barrier breaches.

- STD COL 9.5-6

The applicant provided additional information in STD COL 9.5-6 to resolve COL Information Item 9.5-6 (COL Action Item 9.5.1-6) by specifying a preoperational testing program to verify field installed fire barriers are as tested, and to provide disposition for any deviation.

- VCS COL 9.5-1

The applicant provided additional information in VCS COL 9.5-1 to resolve COL Information Item 9.5-1 regarding applicant-specific aspects for the qualification requirements for the fire protection program.

- VCS COL 9.5-2

The applicant provided additional information in VCS COL 9.5-2 to resolve COL Information Item 9.5-2 (COL Action Item 9.5.1-2) by providing site-specific fire hazard analysis of the yard areas and outlying buildings in VCSNS COL FSAR Appendix 9A, Section 9A.3.3.

Supplemental Information

- STD SUP 9.5-1

The applicant provided supplemental information in Section 9.5.1.2.1.3, “Fire Water Supply System,” by adding additional text to address the piping threads compatibility requirement between onsite hydrants, hose couplings, and standpipe risers and equipment used by the offsite fire department.

License Conditions

- Part 10, License Condition 3, Items C.2, D.1 and G.6

The applicant proposed a license condition in Part 10 of the VCSNS COL application addressing the Fire Protection Program implementation milestones.

- Part 10, License Condition 6

The applicant proposed a license condition in Part 10 of the VCSNS COL application to provide a schedule to support the NRC's inspection of operational programs, including the Fire Protection Program.

9.5.1.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the FPS are given in Section 9.5.1 of NUREG-0800.

The regulatory basis and guidance documents for acceptance of STD COL 9.5-1, STD COL 9.5-3, STD COL 9.5-4, STD COL 9.5-6, STD COL 9.5-8, VCS COL 9.5-1, and VCS COL 9.5-2 includes the following:

- RG 1.189
- Branch Technical Position (BTP) CMEB 9.5-1, in NUREG-0800, Revision 3
- 10 CFR 50.48, "Fire Protection"

The regulatory basis for acceptance of STD SUP 9.5-1 includes the following:

- RG 1.189

9.5.1.4 *Technical Evaluation*

The NRC staff reviewed Section 9.5.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the fire protection system. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced[9] from Section 9.5.1.4 of the VEGP SER:

Supplemental Information

- *STD SUP 9.5-1 provided supplemental information within Section 9.5.1.2.1.3, "Fire Water Supply System," addressing compatibility of piping threads with equipment used by the off-site fire department.*

The NRC staff reviewed the information on the compatibility of piping threads with off-site equipment included under Section 9.5.1.2.1.3 of the BLN COL, and determined that the applicant conforms to the guidance of RG 1.189. In accordance with the applicant's response to RAI 14.2-9, the requirement to verify fire equipment hose thread compatibility, or alternatively, an adequate supply of readily available thread adapters will be verified. This was added to the Initial Test Program outlined in Section 14.2 of the BLN COL FSAR.

AP1000 COL Information Items

- *STD COL 9.5-1 (COL Action Item 9.5-1(a)), involving qualification requirements for the fire protection program*

The applicant provided additional information in STD COL 9.5-1 to resolve COL Information Item 9.5-1. COL Information Item 9.5-1 states:

> *The Combined License applicant will address qualification requirements for individuals responsible for development of the fire protection program, training of firefighting personnel, administrative procedures and controls governing the fire protection program during plant operation, and fire protection system maintenance.*

The commitment was also captured as COL Action Item 9.5-1(a) in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will establish a fire protection program at the facility for the protection of structures, systems, and components (SSCs) important to safety. The COL applicant will also establish*

[9] Only the BLN SER text relevant to VCSNS is reproduced here. For example, the BLN SER included a discussion of BLN SUP 9.5-2 after the discussion of STD SUP 9.5-1. Since BLN SUP 9.5-2 does not apply to VCSNS, it was not reproduced here. Also, the discussion of VCS COL 9.5-2 (corresponds to BLN COL 9.5-2) was moved to the end of this technical evaluation section.

the procedures, equipment, and personnel needed to implement the program.

The NRC staff reviewed the resolution to STD COL 9.5-1 on the qualification requirements for the Fire Protection Program included under Section 9.5.1.6, Section 9.5.1.8, and Section 9.5.1.9 of the BLN COL application, and determined that the above sections provided adequate details to ensure conformance with the regulatory positions contained in RG 1.189 regarding the implementation of the BLN Fire Protection Program. Such details include personnel qualifications and training, organization and responsibilities, fire brigade training, etc.

- *STD COL 9.5-4 (COL Action Item 9.5.1-5), involving NFPA exceptions*

The applicant provided additional information in STD COL 9.5-4 to resolve COL Information Item 9.5-4. COL Information Item 9.5-4 states:

> *The Combined License applicant will address updating the list of NFPA exceptions in the plant-specific DCD, if necessary.*

The commitment was also captured as COL Action Item 9.5.1-5 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant is responsible for ensuring that any deviations from the applicable National Fire Protection Association (NFPA) codes and standards in addition to those in the DCD are incorporated into the final safety analysis report (FSAR) with appropriate technical justification.*

The NRC staff reviewed the resolution to STD COL 9.5-4 under Section 9.5.1.8.1.1 and Section 9.5.1.9.4 of the BLN COL. The applicant provided for BLN COL FSAR Table 9.5-202, Exceptions to NFPA Standard Requirement, to document and justify deviations from applicable NFPA codes and standards in addition to those identified in the DCD. This provision satisfies FSER Action Item 9.5.1-5. The staff also reviewed the exception to NFPA 804 related to the intake structure as documented in Table 9.5-202 although NFPA 804 is not formally endorsed by the NRC as a regulatory guidance document. Since the exception and the provided justification are consistent with the guidance of RG 1.189, the staff finds it acceptable. Based on the above, the staff concludes that FSER Action Item 9.5.1-5 is resolved.

- *STD COL 9.5-8 (COL Action Item 9.5.1-3), establishing procedures to minimize risk for fire areas breached during maintenance*

The applicant provided additional information in STD COL 9.5-8 to resolve COL Information Item 9.5-7. COL Information Item 9.5-7 states:

> *The Combined License applicant will establish procedures to minimize risk when fire areas are breached during maintenance. These procedures will address a fire watch for fire areas breached during maintenance.*

The commitment was also captured as COL Action Item 9.5.1-3 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will establish procedures to address a fire watch for fire areas breached during maintenance.*

The NRC staff reviewed the resolution to STD COL 9.5-8 on the establishment of procedures to minimize risk for fire areas breached during maintenance included under Section 9.5.1.8.1.2 and Section 9.5.1.9.7 of the BLN COL, and determined that the applicant has adequately included a provision to have procedures and administrative controls in place, including fire watches, when fire barriers are breached.

- *STD COL 9.5-6 (COL Action Item 9.5.1-6), involving verification of field installed fire barriers, also designated as a COL information item*

The applicant provided additional information in STD COL 9.5-6 to resolve COL Information Item 9.5-6. COL Information Item 9.5-6 states:

> *The Combined License applicant will address the process for identifying deviations between the as-built installation of fire barriers and their tested configurations.*

The commitment was also captured as COL Action Item 9.5.1-6 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will establish the process for identifying deviations between the as-built installation of fire barriers and their tested configurations.*

The NRC staff reviewed the resolution to STD COL 9.5-6 under Section 9.5.1.8.6 and Section 9.5.1.9.6. The applicant provided that new installation or modification of fire barriers not part of the AP1000 DCD will be controlled through administrative procedures. These procedures impose inspection and testing requirements to ensure that the as-built fire barrier configurations match tested configurations. These procedures also describe the process for identifying and dispositioning deviations. Based on the above, the staff concluded that FSER Action Item 9.5.1-6 is resolved.

- *STD COL 9.5-3 (COL Action Items 9.5.1-1(b) through 9.5.1-1(o)), addressing regulatory conformance*

The applicant provided additional information in STD COL 9.5-3 to resolve COL Information Item 9.5-3. COL Information Item 9.5-3 states:

> *The Combined License applicant will address BTP CMEB 9.5-1 issues. The acronym 'WA' is the identifier in Table 9.5.1-1 for "will address."*

The commitment was also captured as COL Action Items 9.5.1-1(b) through 9.5.1-1(o) in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *9.5.1-1(b) – The COL applicant will implement the fire protection program prior to receiving fuel onsite for fuel storage areas, and for the entire unit prior to reactor startup.*
>
> *9.5.1-1(c) – The COL applicant will establish administrative controls to maintain the performance of the fire protection system and personnel.*
>
> *9.5.1-1(d) – The COL applicant will establish a site fire brigade that is trained and equipped for fire fighting to ensure adequate manual fire fighting capability for all plant areas containing SSCs important to safety.*
>
> *9.5.1-1(e) – The COL applicant will establish a quality assurance (QA) program to ensure that the guidelines for the design, procurement, installation, and testing, as well as the administrative controls for fire protection systems are satisfied.*
>
> *9.5.1-1(f) – The COL applicant is responsible for the inspection and maintenance of fire doors, access to keys for the fire brigade, and the marking of exit routes.*
>
> *9.5.1-1(g) – The COL applicant is responsible for the collection and sampling of water drainage from areas that may contain radioactivity.*
>
> *9.5.1-1(h) – The COL applicant is responsible for controlling the use of compressed gases inside structures.*
>
> *9.5.1-1(i) – The COL applicant is responsible for the use of portable radio communication by the plant fire brigade.*
>
> *9.5.1-1(j) – The COL applicant is responsible for fire protection inside containment during refueling and maintenance.*
>
> *9.5.1-1(k) – The COL applicant is responsible for controlling combustible materials in the remote shutdown workstation.*
>
> *9.5.1-1(l) – The COL applicant is responsible for fire protection for cooling towers.*
>
> *9.5.1-1(m) – The COL applicant is responsible for the proper storage of welding gas cylinders.*

9.5.1-1(n) – The COL applicant is responsible for the proper storage of ion exchange resins.

9.5.1-1(o) – The COL applicant is responsible for the proper storage of hazardous chemicals.

The NRC staff reviewed the resolution to STD COL 9.5-3 provided in Section 9.5.1.8, Fire Protection Program, and Table 9.5-201 of the BLN COL application. The staff determined that the applicant has incorporated the appropriate portions of RG 1.189 into the BLN Fire Protection Program, pending some changes to be included in Revision 2 to the BLN COL FSAR. The applicant provided the following clarifications related to the BLN Fire Protection Program:

(1) The applicant confirmed that no operator manual actions outside of the Main Control Room are credited or required for post-fire safe shutdown.

(2) The applicant stated that the wireless telephone system is credited as the portable communication system used by the fire brigade. In the applicant's response to RAI 9.5.1-12, the wireless telephone system was confirmed to be designed with multiple antennas (repeaters) throughout the plant to maintain communication capability if individual repeater(s) are damaged from fire. Also, preoperational and periodic testing during fire drills will be performed to verify that the fire brigade portable communication system operates without excessive interference at different locations inside and outside the plant.

(3) In its response to RAI 9.5.1-9, the applicant stated that a housekeeping program is provided in order to maintain cleanliness and minimize fire hazards in the Main Control Room areas.

(4) In its response to RAI 9.5.1-14, the applicant stated that no probabilistic risk assessment (PRA) or fire modeling results will be credited to demonstrate acceptable fire hazards or post-fire safe shutdown capability for specific fire areas or scenarios.

(5) In its response to RAI 9.5.1-15, the applicant confirmed that the supply of reserve air is sufficient to provide at least 6 hours of additional breathing air for "each" of the 10 self-contained breathing apparatus (SCBA) units.

(6) In its response to RAI 9.5.1-16, the applicant proposed a change to BLN COL FSAR Section 9.5.1.8.6 to clarify that testing and inspection of fire protection systems are to be performed per NFPA 25 and NFPA 72 as appropriate. This is ***Confirmatory Item 9.5-1****.*

(7) In its response to RAI 9.5.1-17, the applicant confirmed that the design pressure of the High Pressure Air Subsystem that is used to recharge fire brigade's SCBAs is 4000 psig, and that 2216 psig SCBAs are used to ensure that the cylinders are adequately charged to provide an operating life of at least 30 minutes.

License Conditions

- *License Condition 3, addressing the Fire Protection Program implementation milestones*

- *License Condition 6, addressing the Fire Protection Program implementation schedule*

In Part 10 of the BLN COL FSAR, License Condition 3, "Operational Program Implementation," the applicant proposed a license condition for the implementation of operational programs as described in Table 13.4-201 of the FSAR. This license condition included implementation milestones for the Fire Protection Program, namely D.1 and G.6. Specifically:

- *Milestone D.1 states that the applicable portions of the Fire Protection Program will be implemented prior to initial receipt of fuel onsite.*

- *Milestone G.6 states that the Fire Protection Program will be implemented prior to initial fuel load.*

In Part 10 of the BLN COL FSAR, proposed License Condition 6, "Operational Program Readiness," the applicant states:

> *The licensee shall submit to the appropriate Director of the NRC, a schedule, no later than 12 months after issuance of the COL, that supports planning for and conduct of the NRC inspection of the operational programs listed in the operation program FSAR Table 13.4-201. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until either the operation programs in the FSAR table have been fully implemented or the plant has been placed in commercial service.*

Based on the above, the staff concludes that the applicant satisfied the documentation and implementation requirements for the Fire Protection Program in accordance with RG 1.189 by identifying and providing the implementation schedule for each of the operational program aspects of the Fire Protection Program.

Correction of Error in the Standard Content Evaluation Text

The NRC staff identified an error in the text reproduced above from Section 9.5.1.4 of the BLN SER that requires correction. The BLN SER includes the following statement: "The applicant provided additional information in STD COL 9.5-8 to resolve COL Information Item 9.5-7. COL Information Item 9.5-7 states:" The reference to COL Information Item 9.5-7 should be to COL Information Item 9.5-8.

Resolution of Standard Content Confirmatory Item 9.5-1

To resolve Confirmatory Item 9.5-1, the VEGP applicant revised FSAR Section 9.5.1.8.6 to clarify that procedures governing the inspection, testing, and maintenance of fire protection alarm and detection systems, and water-based suppression and supply systems, use the guidance of NFPA 72, "National Fire Alarm and Signaling Code," and NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," as appropriate. NFPA 25 standard is also added to VEGP COL FSAR Section 9.5.5. The staff determined that these documentation changes satisfy the requirement of standard content Confirmatory Item 9.5-1; therefore Confirmatory Item 9.5-1 is resolved.

The following portion of this technical evaluation section is reproduced from Section 9.5.1.4 of the VEGP SER:

Proposed License Condition 3, Item C.2

The VEGP applicant proposed to add another implementation milestone associated with the Fire Protection System to License Condition 3. Specifically, the applicant added Milestone C.2, which states that the applicable portions of the Fire Protection Program will be implemented prior to initial receipt of byproduct, source, or special nuclear materials onsite (excluding Exempt Quantities as described in 10 CFR 30.18). The staff concludes that the applicant satisfied the documentation and implementation requirements for the Fire Protection Program in accordance with RG 1.189 by identifying and providing the implementation schedule for each of the operational program aspects of the Fire Protection Program.

AP1000 COL Information Items

- VCS COL 9.5-1

The applicant provided additional information in VCS COL 9.5-1 to resolve COL Information Item 9.5-1 for plant-specific fire protection issues. These plant-specific issues include:

- The responsibilities of the engineer in charge of fire protection and his staff.
- The organization of the fire brigade.
- The on-duty shift supervisor's responsibility for taking certain actions based on an assessment of the magnitude of the fire emergency.
- Control actions to be taken by the control room operator, such as sounding fire alarms, and notifying the shift supervisor of the type, size and location of the fire.
- Operations requiring control room and shift supervisor coordination or authorization.
- The engineer in charge of fire protection is responsible for the formulation and implementation of the fire protection program and meets the qualification requirements listed in VCSNS COL FSAR Section 13.1.1.3.2.1.4.

The NRC staff compared the plant-specific fire protection issues under VCS COL 9.5-1 with the subject matter addressed by the standard content evaluation of STD COL 9.5-1, as detailed above. The staff concludes that the issues addressed by VCS COL 9.5-1 are included in the subject matter addressed by the staff in its evaluation of STD COL 9.5-1 and, therefore, concludes VCS COL 9.5-1 conforms to the regulatory positions in RG 1.189 regarding the implementation of the VCS Fire Protection Program.

- VCS COL 9.5-2

The applicant provided additional information in VCS COL 9.5-2 to resolve COL Information Item 9.5-2. COL Information Item 9.5-2 states:

> The Combined License applicant will provide site-specific fire protection analysis information for the yard area, the administration building, and for other outlying buildings consistent with Appendix 9A.

The commitment was also captured as COL Action Item 9.5.1-2 in Appendix F of NUREG-1793, which states:

> The COL applicant will provide site-specific fire protection analysis information for the yard area, the administration building, and other outlying buildings.

The NRC staff reviewed the resolution to VCS COL 9.5-2 on the site-specific fire protection analysis information included under Section 9.5.1.9.2 and Section 9A.3.3 of the VCSNS COL FSAR, and determined that the yard area, administration building and other outlying areas are adequately described in accordance with RG 1.189 in the fire hazard analysis, which is, therefore, acceptable.

Resolution of VCS DEP 18.8-1

The AP1000 Annex Building does not contain any system or equipment credited for achieving and maintaining post-fire safe shutdown. As such, the relocation of the OSC in the Annex Building as prescribed in VCS DEP 18.8-1 has no adverse impact on the post-fire safe shutdown capability. Therefore, the staff concludes that the proposed departure, relative to post-fire safe shutdown capability, is acceptable.

Resolution of Site-Specific RAIs

In addition to the review of the standard content, the staff also reviewed VEGP site-specific content and issued two site-specific RAIs, RAIs 9.5.1-1 and 9.5.1-2, related to the qualifications of the engineer in charge of fire protection and fire brigade training, respectively.

In its response to the site-specific RAI related to the qualifications of the engineer in charge of fire protection, the applicant revised FSAR Section 13.1.1.3.2.1.4 to state that the engineer in charge of fire protection is trained and experienced in nuclear safety or has available personnel who are trained and experienced in nuclear plant safety. In addition, this FSAR section states that in accordance with RG 1.189, the engineer in charge of fire protection is a graduate of an engineering curriculum of accepted standing and has completed not less than six years of engineering experience, three of which were in a responsible position in charge of fire protection

engineering work. Based on the above, the staff finds the description of the fire protection engineer qualifications is in accordance with RG 1.189 and, therefore, is acceptable.

In its response to the site-specific RAI related to fire brigade training, the applicant revised FSAR Section 13.1.1.3.2.2.1 to state that the functional manager in charge of nuclear training is responsible for training programs at the site, including fire brigade training. In addition, this FSAR section was revised to state that the functional manager in charge of training ensures individuals providing fire brigade training are qualified by knowledge, suitable training, and experience for such work, and that coordination with the engineer in charge of fire protection is maintained. Based on the above, the staff finds the description of the training program for the fire brigade is in accordance with RG 1.189 and, therefore, is acceptable.

9.5.1.5 *Post Combined License Activities*

For the reasons discussed in the technical evaluation section above, the staff finds the following license conditions proposed by the applicant acceptable:

- License Condition (9-2) - The licensee shall implement the Fire Protection Program or portions of the FP Program identified below on or before the associated milestones identified below.

    1. Applicable portions of the FP Program – prior to initial receipt of byproduct, source, or special nuclear materials onsite (excluding Exempt Quantities as described in 10 CFR 30.18).

    2. Applicable portions of the FP Program – prior to initial receipt of fuel onsite.

    3. FP Program – prior to initial fuel load.

- License Condition (9-3) – No later than 12 months after issuance of the COL, the licensee shall submit to the Director of NRO a schedule that supports planning for and conduct of NRC inspections of the Fire Protection Program. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the FP Program has been fully implemented.

9.5.1.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the fire protection system, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidance in Section 9.5.1 of NUREG-0800 and RG 1.189. The staff based its conclusion on the following:

- STD SUP 9.5-1, addressing compatibility of piping threads with equipment used by the offsite fire department, is adequately addressed by the applicant and is resolved.

- STD COL 9.5-1, addressing the qualification and training requirements for the fire protection program at VCSNS, is adequately addressed by the applicant and is resolved.

- STD COL 9.5-4, addressing the deviations from the applicable NFPA codes and standards and to those in the AP1000 DCD, is also adequately addressed by the applicant and is resolved.

- STD COL 9.5-6, addressing the establishment of a process for identifying deviations between the as-built installation of fire barriers and their tested configurations is adequately addressed by the applicant and is resolved.

- STD COL 9.5-8, addressing establishment of procedures to minimize risk for fire areas breached during maintenance is adequately addressed by the applicant and is resolved.

- STD COL 9.5-3, addressing the site-specific implementation of the Fire Protection Program is adequately addressed by the applicant and is resolved.

- VCS COL 9.5-1, addressing the plant-specific issues for the fire protection program at VCSNS, is adequately addressed by the applicant and is resolved.

- VCS COL 9.5-2, addressing the site-specific fire protection analysis information for the VCSNS yard areas and outlying buildings is adequately addressed by the applicant and is resolved.

- VCS DEP 18.8-1, addressing the relocation of the OSC relative to the post-fire safe shutdown capability, is adequately addressed by the applicant and is resolved.

9.5.2 Communication System

9.5.2.1 *Introduction*

The communication system provides intra-plant communications and plant-to-offsite communications during normal, maintenance, transient, fire, and accident conditions, including LOOP.

9.5.2.2 *Summary of Application*

Section 9.5 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.5 of the AP1000 DCD, Revision 19. Section 9.5 of the DCD includes Section 9.5.2.

In addition, in VCSNS COL FSAR Section 9.5.2, the applicant provided the following:

AP1000 COL Information Items

- VCS COL 9.5-9, involving offsite interfaces

The applicant provided additional information in VCS COL 9.5-9 to resolve COL Information Item 9.5-9 (COL Action Item 9.5.2-3).

- VCS COL 9.5-10, involving emergency offsite communications

The applicant provided additional information in VCS COL 9.5-10 to resolve COL Information Item 9.5-10 (COL Action Item 9.5.2-1).

- VCS COL 9.5-11, involving security communications

The applicant provided additional information in VCS COL 9.5-11 to resolve COL Information Item 9.5-11 (COL Action Item 9.5.2-2).

9.5.2.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the communications system are given in Section 9.5.2 of NUREG-0800.

The regulatory basis for VCS COL 9.5-9, addressing interfaces to offsite locations, is based on:

- Appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities," to 10 CFR Part 50, Part IV.E(9), "Emergency Planning and Preparedness for Production and Utilization Facilities"

The regulatory basis for VCS COL 9.5-10, addressing the emergency offsite communication system, including the crisis management radio system, is based on:

- 10 CFR 50.47(b)(8), "Emergency plans"

The regulatory basis for VCS COL 9.5-11, addressing the description of the security communication system is based on:

- 10 CFR 73.45 (g)(4)(i), "Performance capabilities for fixed site physical protection systems-response"

- 10 CFR 73.46 (f), "Fixed site physical protection systems, subsystem, components, and procedures-communications subsystems"

- 10 CFR 73.55(e), "Requirements for physical protection of licensed activities in nuclear power reactors against radiological sabotage-physical barriers"

- 10 CFR 73.55(f), "Requirements for physical protection of licensed activities in nuclear power reactors against radiological sabotage-target sets"

9.5.2.4 *Technical Evaluation*

The NRC staff reviewed Section 9.5.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the communications system. The results of the NRC staff's evaluation of

the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, in VCSNS COL FSAR Section 9.5.2, the applicant provided the following:

AP1000 COL Information Items

- VCS COL 9.5-9

The applicant provided additional information in VCS COL 9.5-9 to resolve COL Information Item 9.5-9. COL Information Item 9.5-9 states:

> Combined License applicants referencing the AP1000 certified design will address interfaces to required offsite locations; this will include addressing the recommendations of BL-80-15 ([DCD] Reference 21) regarding loss of the emergency notification system due to a loss of offsite power.

The commitment was also captured as COL Action Item 9.5.2-3 in Appendix F of NUREG-1793, which states:

> The COL applicant will address interfaces to offsite locations; this will include addressing the recommendations of NRC Bulletin (BL) 80-15 regarding loss of the emergency notification system as a result of loss of offsite power.

The NRC staff reviewed VCS COL 9.5-9 involving offsite interfaces included under Section 9.5.2.5.1 of the VCSNS COL FSAR. Section 9.5.2.5.1 of the VCSNS COL FSAR states that VCS COL 9.5-9 is addressed in Part 2, Section F, "Emergency Communications," of the VCSNS Emergency Plan. Section F of the VCSNS Emergency Plan states that the primary system for providing onsite and offsite communications is the Electric Switch System Exchange (ESSX). The ESSX provides communications to county and state warning points and Emergency Operating Facilities (EOFs) from each Control Room, the TSC and the EOF. For VCSNS, the ESSX serves as the Emergency Notification System (ENS). The Emergency Plan (EP) states that backup communication methods include facsimile, commercial telephone lines, radios, and the internet. In the event of an emergency at the station, notification and activation of county and state emergency response facilities are established. This network requires communication interfaces between the site and the following offsite agencies:

- South Carolina State EOF
- Fairfield County Warning Point
- Lexington County Warning Point
- Newberry County Warning Point
- Richland County Warning Point

The following is a summation of the various communication methodologies used under the ESSX:

1. **Dedicated Phone Lines**: A dedicated phone link is established by limiting a phone line to one purpose, blocking its use for all other purposes. These dedicated lines are considered the ESSX. Several dedicated telephone links have been established for use by the Emergency Response Organization (ERO) to perform key communications tasks. Some of these tasks are listed below:

    - Communications between the affected unit's Control Room, the TSC, and the OSC to coordinate the dispatching of emergency damage control teams from the OSC.

    - Communications between the affected Unit Control Room, the TSC, and the EOF to monitor the activities of that Control Room staff and provide technical data to facilities outside that Control Room

    - Conferencing between the TSC and the EOF to communicate mitigating activities and priorities for the station to the EOF

    - Communications between Emergency Director (ED) in the EOF, the Control Room, and the TSC

    - Communications between EOF and State Warning Points

2. **Private Branch Exchange (PBX) Telephone System**: The PBX telephone system will provide communication capabilities between telephones located within the VCSNS facilities through direct dialing. The PBX is used to connect the affected unit's control room, TSC, OSC, and the EOF. The PBX telephone system also provides for outside communications through interconnections with the corporate telephone communications system and commercial telephone lines. The PBX telephone system serves as a backup to the ESSX.

3. **Local Commercial Telephone System**: This system provides standard commercial telephone service through the public infrastructure, consisting of central offices and the wire line carrier. The commercial telephone system includes connections to PBX, emergency telephone system, dedicated lines to emergency facilities, and lines to the Joint Information Center (JIC). The commercial vendor provides primary and secondary power for their lines at their central office. The local lines also serve as a backup method of offsite communications to the ESSX.

4. **Emergency Response Data System (ERDS)**: As prescribed by 10 CFR Part 50, Appendix E, Section VI, ERDS will supply the NRC with selected plant data points on a near real time basis. ERDS is activated by the ERO as soon as possible but not later than one hour after declaration of an alert, site area emergency, or general emergency. The selected data points are transmitted via modem to the NRC at approximately 1-minute intervals. The ERO has backup methods available to provide required information to the NRC in the event that ERDS is inoperable during the declared emergency.

5. **Field Monitoring Team Communications**: A separate radio communications channel has been installed to allow coordinated environmental monitoring and assessment during an emergency. This system consists of the necessary hardware to allow radio communication between the affected unit's Control Room, EOF, and mobile units in VCSNS vehicles. Commercial cell phones, satellite phones, or other means are available as backup to the primary field team communications system.

6. **Satellite Telephones**: Satellite telephones are provided to each Control Room, the TSC, and the EOF providing a backup communication link in the event that the landlines are rendered inoperative. These units are equipped with outside antennae permitting the use of the communications device inside the facilities. Satellite telephones are considered a backup communications avenue in the case of a failure of ESSX.

7. **800 MHz Radio**: This radio is available as a backup notification device to the offsite authorities at selected county warning points and is separate from the Field Monitoring Team Communications radio channel. This system is the Crisis Management Radio System and serves as a backup to ESSX.

8. **NRC Communications**: Communications with the NRC Operations Center will be performed via the NRC ENS and the Health Physics Network (HPN) circuits or commercial and satellite telephone lines. Information is normally communicated from an approved NRC Event Notification Worksheet before establishing an open ENS and/or HPN line.

    8a. **ENS**: The applicant states that there is dedicated telephone equipment in place between each Control Room and the NRC, with an extension of that line in the TSC. A separate line is available in the EOF with the capability of being patched with the station through the NRC. This line is used for NRC event notifications and status updates. Backup power is provided for these lines.

    8b. **HPN**: A separate dedicated telephone between the NRC, the TSC, and the EOF for conveying health physics information to the NRC as requested or as an open communication line. Backup power is provided for these lines.

9. **Miscellaneous**: In addition, station communication links exist to ensure appropriate information transfer capabilities during an emergency. The station may also use its public address system, video conferencing systems, computer network connections and pagers to augment its emergency communications.

Appendix E to 10 CFR Part 50, Section IV.E (9) requires at least one onsite and one offsite communications system; each system shall have a backup power source. In addition, NRC Bulletin 80-15 states that the applicant should provide backup power sources for the ENS in case of LOOP. The staff requested additional clarification in RAI 9.5.2-8 on the primary and backup power supplies as well as information on the transfer method during a LOOP. In its April 1, 2010, response to the RAI, the applicant stated that the ENS and ERDS are both powered normally by the 120V-ac power system. Should a loss of the ac power system occur, the ENS and ERDS are automatically switched over to the diesel-backed, non-Class 1E dc and uninterruptible power supply systems. The use of an uninterruptible power supply and diesel generator to provide backup power to the ENS in case of LOOP adequately addresses NRC Bulletin 80-15.

The staff finds the design of the emergency communications system provides sufficient means for onsite and offsite communications, provides adequate backup communications methods, and provides adequate primary and backup power sources, to meet the requirements of Appendix E to 10 CFR Part 50, Section IV.E(9). Therefore, the staff concludes that COL Action Item 9.5.2-3 has been resolved pending incorporation of the proposed revision in the VCSNS COL FSAR which is being tracked as **Confirmatory Item VCSNS 9.5-1**.

Resolution of Confirmatory Item VCSNS 9.5-1

Confirmatory Item VCSNS 9.5-1 is an applicant commitment to revise FSAR Section 9.5.2 to make changes to the emergency communication description. The staff verified that the VCSNS COL FSAR was appropriately revised. As a result, Confirmatory Item VCSNS 9.5-1 is now closed.

- VCS COL 9.5-10

The applicant provided additional information in VCS COL 9.5-10 to resolve COL Information Item 9.5-10. COL Information Item 9.5-10 states:

> The emergency offsite communication system, including the crisis management radio system, will be addressed by the Combined License applicant.

The commitment was also captured as COL Action Item 9.5.2-1 in Appendix F of NUREG-1793, which states:

> The COL applicant will provide a description of the emergency offsite communication system, including the crisis management radio system.

The staff reviewed VCS COL 9.5-10 concerning the emergency offsite communication system including the crisis management radio system under Section 9.5.2.5.2 of the VCSNS COL FSAR. Section 9.5.2.5.2 of the VCSNS COL FSAR states that VCS COL 9.5-10 is addressed in Part 2, Section F, "Emergency Communications," of the VCSNS EP. The communication interfaces to offsite locations consist of the systems described in VCS COL 9.5-9 of this SER. This includes the following methods:

- PBX telephone system
- Local commercial telephone system
- Satellite telephones
- 800 MHz radio communications

The staff requested the applicant clarify whether the 800 MHz radio system is the crisis management radio system since this is not stated explicitly in either the VCSNS COL FSAR or the EP. The staff requested additional clarification in RAI 9.5.2-8 on the design of the 800 MHz radio system. In its April 1, 2010, response to the RAI, the applicant stated that the 800 MHz radio system serves as the Crisis Management Radio System. The system utilizes base stations and remote units in conjunction with associated cabling, repeaters and antennas to provide optimum coverage for continuous, two-way communications.

The applicant also stated that the radio system is divided into a "trunked system" used by corporate subsidiaries. The trunked system at VCSNS consists of channels specifically

designated for maintenance, operations, health physics, field monitoring teams, etc. The trunked system facilitates communications between site personnel for normal and emergency situations.

Trunked system designs for radio communications are commonly used by Federal and states authorities such as fire departments, police dispatch, etc. The trunked system design allows for multiple users (talk-groups), to use a small set of actual radio frequencies without hearing each other's conversations. With a trunked system, there is no 'dedicated' channel as in a conventional radio system so if a particular frequency channel is interrupted or there is a break in communications, a controlling computer will automatically rotate the affected talk-group to the next available frequency. The design allows two-way continuous communication between plant personnel and offsite authorities at county warning points.

10 CFR 50.47(b)(8) requires that adequate emergency facilities and equipment to support the emergency response be provided and maintained. Section N.2.a of the VCSNS EP states that the applicant will test the primary and alternative emergency communications systems as part of the EP drills on a monthly, quarterly and annual basis. The drills include verification of communication with onsite and offsite sources, including the NRC, TSC, JIC and EOFs. The staff finds the offsite communications systems described above, and in VCS COL 9.5-9 of this evaluation, are adequate in providing emergency communications equipment and facilities, and the proposed testing frequencies are adequate. In conclusion, the staff finds the 800 MHz radio system adequately serves as the Crisis Management Radio System and meets the requirements of 10 CFR 50.47(b)(8). Therefore, the staff concludes that COL Action Item 9.5.2-1 has been resolved pending incorporation of the proposed revision in the VCSNS COL FSAR which is being tacked as **Confirmatory Item VCSNS 9.5-2**.

Resolution of Confirmatory Item VCSNS 9.5-2

Confirmatory Item VCSNS 9.5-1 is an applicant commitment to revise FSAR Section 9.5.2 to update the description of the 800MHz radio system. The staff verified that the VCSNS COL FSAR was appropriately revised. As a result, Confirmatory Item VCSNS 9.5-2 is now closed.

- VCS COL 9.5-11

The applicant provided additional information in VCS COL 9.5-11 to resolve COL Information Item 9.5-11. COL Information Item 9.5-11 states:

> Specific details for the security communication system are as discussed in separate security documents referred to in Section 13.6.

The commitment was also captured as COL Action Item 9.5.2-2 in Appendix F of NUREG-1793, which states:

> The COL applicant will provide a description of the security communication system.

The staff's review of VCS COL 9.5-11 related to security communications is documented in Section 13.6 of this SER.

9.5.2.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

9.5.2.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the communication system, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidelines given in Section 9.5.2 of NUREG-0800. The staff based its conclusion on the following:

- VCS COL 9.5-9 has been adequately addressed by the applicant in that the onsite and offsite communications interfaces meet the communications requirements of 10 CFR Part 50, Appendix E, Section IV.E(9). In addition, the staff finds the emergency diesel generator capable of providing backup power for the emergency notification system in case of LOOP, and thus meets the guidance in NRC Bulletin 80-15.

- VCS COL 9.5-10 has been adequately addressed by the applicant in that the VCSNS emergency offsite communications system is capable of providing for notification of personnel and implementation of evacuation procedures in case of emergency and meets the requirements of 10 CFR 50.47(b)(8).

- VCS COL 9.5-11, which involves security communications, is documented in Section 13.6 of this SER.

9.5.3 Plant Lighting System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.5.3, "Lighting Systems")

The plant lighting system provides normal, emergency, panel, and security lighting. The normal lighting provides normal illumination during plant operating, maintenance, and test conditions. The emergency lighting provides illumination in areas where emergency operations are performed upon loss of normal lighting. The panel and security lighting is designed to provide the minimum illumination required.

Section 9.5 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.5.3, "Plant Lighting System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.5.4 Diesel Generator Fuel Oil System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.5.4, "Diesel Generator Fuel Oil Storage and Transfer System)

9.5.4.1 *Introduction*

The standby diesel generator fuel oil system maintains the fuel oil system for the diesel engines that provide backup onsite power. This system includes all piping up to the connection to the engine interface, fuel oil storage tanks, fuel oil transfer pumps, day tanks, and the tank storage vaults.

9.5.4.2 *Summary of Application*

Section 9.5 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 9.5 of the AP1000 DCD, Revision 19. Section 9.5 of the AP1000 DCD includes Section 9.5.4.

In addition, in VCSNS COL FSAR Section 9.5.4.5.2, the applicant provided the following:

AP1000 COL Information Item

- STD COL 9.5-13

The applicant provided additional information in STD COL 9.5-13 to resolve fuel oil sampling and testing to protect against degradation.

9.5.4.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the diesel generator fuel oil system are given in Section 9.5.4 of NUREG-0800.

9.5.4.4 *Technical Evaluation*

The NRC staff reviewed Section 9.5.4 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the diesel generator fuel oil system. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside of the scope of the DC and use this review in evaluating subsequent COL applications. To ensure the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 9.5.4.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 9.5-13*

The applicant provided additional information in STD COL 9.5-13 to resolve COL Information Item 9.5-13. COL Information Item 9.5-13 states:

> *Address the diesel fuel specifications grade and the fuel properties consistent with manufacturers' recommendations and the measures to protect against fuel degradation by a program of fuel sampling and testing.*

The commitment was also captured as COL Action Item 9.5.9-2 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will develop site-specific factors in the fuel oil storage tank installation specification to reduce the effects of sun heat input into the stored fuel, as well as the diesel fuel specifications grade and fuel properties consistent with manufacturers' recommendations, and will develop a program of fuel sampling and testing to protect against fuel degradation.*

Revision 17 of the DCD addressed the requirement for limiting heat input by specifying a white epoxy-urethane coating system. Therefore, this information is no longer required from COL applicants.

The COL information in Revision 0 of the applicant's FSAR added Section 9.5.4.5.2, "Fuel Oil Quality." The new section addressed fuel quality as follows:

> *High fuel oil quality is provided by specification of the required grade and properties of the fuel oil for procurement, by testing of samples of new fuel oil prior to addition into the tanks, and by monitoring the fuel oil for contamination and degradation with periodic testing of samples from the storage tanks in accordance with manufacturer's recommendations.*
>
> *The fuel oil storage tanks are inspected at least once per 92 days to check for and remove accumulated water.*
>
> *The fuel oil quality is verified by sampling and testing from the storage tanks at least once per 92 days. New fuel oil is tested prior to its addition to the storage tanks to verify that the sample meets the following minimum requirements:*
>
> - *Water and sediment content of less than or equal to 0.05 volume percent.*
> - *Kinematic viscosity at 40°C of greater than or equal to 1.9 mm2/s (1.9 centistokes), but less than or equal to 4.1 mm2/s (4.1 centistokes).*
> - *Specific gravity as specified by the manufacturer at 16/16°C (60/60°F), or an API [American Petroleum Institute] gravity at 16°C (60°F), within limits established in accordance with manufacturer's recommendations.*
> - *Tested impurity level of less than 2 mg of insolubles per 100 ml. The analysis is completed within 7 days after obtaining the sample, but may be performed after the addition of new oil.*

As a result of the staff's review of BLN COL FSAR Section 9.5.4.5.2, the staff identified two questions that were submitted to the applicant in RAIs.

In RAI 9.5.4-1(a), the staff requested that the applicant identify the controls in place to ensure the fuel oil quality program is implemented according to BLN COL FSAR Section 9.5.4.5.2. In response, the applicant stated that implementation of the fuel oil program according to the FSAR is ensured by the Quality Assurance Program Description (QAPD) described in Chapter 17 and Part 11 of the COL application. The applicant stated QAPD Part III, Section 1, contains quality controls for non-safety-related SSCs that would require and verify implementation of the fuel oil program based on the FSAR description. The staff reviewed the information provided and concludes the proposed quality control requirements can ensure implementation of the fuel oil program in accordance with the BLN COL FSAR.

In RAI 9.5.4-1(b), the staff requested that the applicant provide quality requirements for the periodic testing of stored fuel oil. Section 9.5.4.5.2 of the BLN COL stated that diesel fuel oil from the storage tanks is sampled and tested, but no requirements were listed. The application listed quality requirements that appeared to apply only to new fuel oil. In its response, the applicant proposed the following revised BLN COL FSAR Section 9.5.4.5.2:

> *The diesel fuel oil testing program requires testing both new fuel oil and stored fuel oil. High fuel oil quality is provided by specifying the use of ASTM [American Society for Testing and Materials] Grade 2D fuel oil with a sulfur content as specified by the engine manufacturer.*
>
> *A fuel sample is analyzed prior to addition of ASTM Grade 2D fuel oil to the storage tanks. The sample moisture content and particulate or color is verified per ASTM 4176. In addition, kinetic [sic] viscosity is tested to be within the limits specified in Table 1 of ASTM D975. The remaining critical parameters per Table 1 of ASTM D975 are verified compliant within 7 days.*
>
> *Fuel oil quality is verified by sample every 92 days to meet ASTM Grade 2D fuel oil criteria. The addition of fuel stabilizers and other conditioners is based on sample results.*
>
> *The fuel oil storage tanks are inspected on a monthly basis for the presence of water. Any accumulated water is to be removed.*

The staff reviewed this revision and finds it acceptable because it addresses both the new and stored fuel oil and the requirements are the manufacturer's specifications and the same ASTM standards applied to safety-related diesel generators. The staff also confirmed that the revised fuel oil testing program was included as shown above in Revision 1 of the BLN COL FSAR.

Correction of Error in the Standard Content Evaluation Text

The NRC staff identified an error in the text reproduced above from Section 9.5.4.4 of the BLN SER that requires correction. The BLN SER includes the following statement: "In addition, kinetic [sic] viscosity is tested to be within the limits specified in Table 1 of the ASTM D975." The world "kinetic" should read as "kinematic." The staff thought this was a typographical error on the applicant's part because Table 1 of ASTM D975, "Standard Specification for Diesel Fuel Oils," *which is the appropriate reference, specifies "kinematic viscosity." Therefore, the staff concludes that STD COL 9.5-13 has been resolved pending incorporation of the proposed revision in the VEGP COL FSAR, which is being tracked as* ***Confirmatory Item 9.5-3****.*

Resolution of Standard Content Confirmatory Item 9.5-3

Confirmatory Item 9.5-3 is an applicant commitment to revise its FSAR Section 9.5.4.4 to correct a typographical error. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 9.5-3 is now closed.

9.5.4.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

9.5.4.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the standby diesel generator fuel oil system, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the guidelines given in Section 9.5.4 of NUREG-0800. The staff based its conclusion on the following:

- STD COL 9.5-13 has been adequately addressed by the applicant in that it ensures that the manufacturers' recommendations using industry standards are met and provides a fuel sampling and testing program to protect against fuel degradation.

9.5.5 Standby Diesel Generator Cooling Water System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.5.5, "Diesel Generator Cooling Water System")

Section 9.5.5 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.5.5, "Standby Diesel Generator Cooling Water System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.5.6 Standby Diesel Generator Starting Air System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.5.6, "Diesel Generator Starting System")

Section 9.5.6 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.5.6, "Standby Diesel Generator Starting Air System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.5.7 Standby Diesel Generator Lubrication System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.5.7, "Diesel Generator Lubrication System")

Section 9.5.7 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.5.7, "Standby Diesel Generator Lubrication System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of

the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

9.5.8 Standby Diesel Generator Combustion Air Intake and Exhaust System (Related to RG 1.206, Section C.III.1, Chapter 9, C.I.9.5.8, "Diesel Generator Combustion Air Intake and Exhaust System")

Section 9.5.8 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 9.5.8, "Standby Diesel Generator Combustion Air Intake and Exhaust System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

10.0 STEAM AND POWER CONVERSION

10.1 Summary Description

10.1.1 Introduction

The steam and power conversion (S&PC) system is designed to remove heat energy from the reactor coolant system via the two main steam generators (SGs) and to convert it to electrical power in the turbine-generator (T-G). The main condenser deaerates the condensate and transfers heat that is not used in the cycle to the circulating water system (CWS). The regenerative turbine cycle heats the feedwater, and the main feedwater system returns it to the SG. This section also addresses the materials selection, fabrication, and fracture toughness of the American Society of Mechanical Engineers (ASME) Code Section III, Class 2 and Class 3 pressure boundary components of the steam and feedwater systems and also discusses material issues identified through operating experience.

10.1.2 Summary of Application

Section 10.1 of the V.C. Summer Nuclear Station (VCSNS) combined license (COL) Final Safety Analysis Report (FSAR), Revision 5, incorporates by reference Section 10.1 of the AP1000 Design Control Document (DCD), Revision 19.

In addition, in VCSNS COL FSAR Section 10.1.3, the applicant provided the following:

AP1000 COL Information Item

- Standard (STD) COL 10.1-1

The applicant provided additional information in STD COL 10.1-1 to address COL Information Item 10.1-1, providing information related to the monitoring of flow-accelerated corrosion (FAC).

License Condition

- Part 10, License Condition 6, Operational Program Readiness

The applicant proposed a license condition to provide a schedule to support the U.S. Nuclear Regulatory Commission's (NRC's) inspection of operational programs including the FAC program.

10.1.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design."

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the FAC program are given in Section 10.1 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)."

The applicable regulatory guidance for STD COL 10.1-1 is as follows:

- Generic Letter (GL) 89-08, "Erosion/Corrosion-Induced Pipe Wall Thinning"

The staff notes that request for additional information (RAI) numbering was based on NUREG-0800, Section 10.3.6. The evaluation is presented in this section because the applicant provided information in Section 10.1.3 of the VCSNS COL FSAR.

10.1.4 Technical Evaluation

The NRC staff reviewed Section 10.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[10] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the S&PC summary description. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this safety evaluation report (SER) provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the design certification (DC) and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (Vogtle Electric Generating Plant (VEGP), Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application.

[10] See Section 1.2.2 for a discussion of the staff's review related to verification of the scope of information to be included in a COL application that references a design certification (DC).

The following portion of this technical evaluation section is reproduced from Section 10.1.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 10.1-1*

The applicant also provided information (STD COL 10.1-1) in BLN COL FSAR Section 10.1.3.1 to address a COL information item as described in AP1000 DCD Section 10.1.3. BLN COL FSAR Section 10.1.3.1, "Erosion-Corrosion Monitoring," describes general attributes of the applicant's program for monitoring and managing degradation (e.g., thinning) of piping and components susceptible to FAC, sometimes called erosion-corrosion.

In AP1000 DCD Section 10.1.3, Westinghouse identified a COL information item on FAC monitoring. The COL information item identified the need for a COL applicant to address the preparation of a FAC monitoring program for carbon steel portions of the S&PC systems that contain water or wet steam in order to address the concerns identified in GL 89-08. Similarly, in the NRC staff's FSER (NUREG-1793), Section 10.3.2, the staff identified COL Action Item 10.3.2-1 for the COL applicant to develop a FAC monitoring program to address industry guidelines and the concerns identified in GL 89-08.

The staff reviewed the information provided by the applicant in Section 10.1.3.1 of the BLN COL FSAR (STD COL 10.1-1) addressing a monitoring program for FAC. The staff also reviewed additional information provided in letters dated June 27, 2008 (ML081830410) and May 26, 2009 (ML091480012). In the letters, the applicant provided additional information requested by the staff about implementation of the FAC program during the plant construction phase, pre-service thickness measurements, and the basis for determining minimum allowable thickness.

In RAI 10.3.6-1, the staff requested that the applicant discuss its implementation schedule for the detailed FAC program (i.e., the FAC program activities that will be conducted during the plant construction phase and the schedule for those activities). This information was not provided in the application and was needed by the staff to make its reasonable assurance finding that the FAC concerns discussed in GL 89-08 are adequately addressed.

In RAI 10.3.6-2, the staff asked the applicant to confirm that its program for addressing and monitoring FAC will include pre-service thickness measurements of as-built components considered susceptible to FAC, and that these measurements will use grid locations and measurement methods most likely to be used for inservice inspection (ISI) according to industry guidelines. In addition, the staff requested that the applicant describe how the pre-service testing requirement was documented in the COL application.

In RAI 10.3.6-3, the staff asked the applicant to identify the industry guidelines or established procedures for determining the minimum allowable wall thickness at which components must be repaired or replaced.

In the June 27, 2008, letter, the applicant responded that susceptibility of piping and components to FAC will be evaluated prior to fuel load as design and as-built information becomes available, and those categorized as high risk for FAC failure will be evaluated for baseline testing prior to startup. For other piping, nominal dimensions may be used until baseline wall thickness is measured, but the applicant did not state when this will occur.

The applicant also proposed revising FSAR Section 10.1.3.1 by deleting the following sentence and replacing it with a paragraph that identifies a specific industry guideline (Electric Power Research Institute (EPRI) NSAC-202L) that contains more details about the approach to FAC monitoring.

> *In addition, the FAC monitoring program considers the information of Generic Letter 89-08 and industry guidelines.*

This revision addressed the staff's concern about the basis for determining the minimum allowable thickness because it references the industry guidance (EPRI NSAC-202L) that addresses the concerns in GL 89-08. The response also addressed the staff's concern about pre-service thickness testing because it affirms the need for pre-service testing, and because the application will reference the guidance of NSAC-202L. The response confirmed that the EPRI CHECWORKS computer program will be used for wall thickness evaluations. Based on operating experience, the staff considers the EPRI guidance document and CHECWORKS program an effective approach to managing FAC. However, the staff also identified open items on this topic as discussed below. The open items are related to information that must be either clarified or added to the COL application.

The response to RAI 10.3.6-1 described how susceptibility to FAC will be evaluated as the design and as-built information becomes available, and high-risk (of FAC) components will be evaluated for baseline testing prior to startup. The staff had the following concerns:

a) *The applicant stated that piping and/or components with a high risk of FAC failure will be "evaluated for baseline testing prior to startup." This statement suggests baseline testing may not be performed on high-risk components.*

b) *The reference to piping and/or components "deemed to have a high risk of failure due to FAC" led the staff to question the extent to which FAC prevention was included in the plant design. Given that the plant has not yet been constructed and a predictive model such as CHECWORKS can estimate FAC rates, it is the staff's understanding that materials susceptible to FAC can be avoided where FAC is a potential degradation mechanism.*

c) *The applicant did not add the FAC program implementation schedule and construction phase activities to the COL application.*

The response to RAI 10.3.6-2 and the associated COL application revisions include the terms "Pass 1 analysis" and "Pass 2 analysis." Since these are terms defined in EPRI NSAC-202L in the context of the CHECWORKS analysis program, reference to CHECWORKS needs to be addressed in the application.

The response to RAI 10.3.6-3 refers to "Systems Not Modeled components." Based on the context of this statement, the staff understands that this statement refers to "Susceptible Not Modeled lines," as discussed in EPRI NSAC-202L.

The applicant submitted a supplemental RAI response dated May 26, 2009 (ML091480012). In the revised responses to the RAIs the applicant clarified that the plant is designed to prevent FAC, and no piping/components are expected to have a high risk of FAC failure, but the possibility of a high-risk piping/component cannot be ruled out until the as-built design is analyzed. The response also clarified that baseline testing would be performed on all high-risk piping/components, and it corrected the wording to reference "Susceptible-Not-Modeled" lines. In the response to RAI 10.3.6-2 the applicant also proposed the following revision to FSAR Section 10.1.3.1:

> *In addition, the FAC monitoring program considers the information of Generic Letter 89-08, EPRI NSAC-202L-R3, and industry operating experience. The program requires a grid layout for obtaining consistent pipe thickness measurements when using Ultrasonic Test Techniques. The FAC program obtains actual thickness measurements for highly susceptible FAC locations for new lines as defined in EPRI NSAC-202L-R3. At a minimum, a CHECWORKS type Pass 1 Analysis is used for low susceptible FAC locations and a CHECWORKS type Pass 2 Analysis for highly susceptible FAC locations will be considered. To determine wear of piping and components where operating conditions are inconsistent or unknown the guidance provided in EPRI NSAC-202L is used to determine wear rates.*

The revised response to RAIs 10.3.6-1, 10.3.6-2, and 10.3.6-3 therefore addressed all of the concerns identified above, with the exception of identifying the program implementation schedule in the application. This is ***Open Item 10.1-1****. The staff identifies the FSAR revisions proposed by the applicant in its May 26, 2009 letter as* ***Confirmatory Item 10.1-1****. Pending resolution of the open item and confirmatory item, the staff finds the COL information item on the FAC program addresses the concerns expressed in GL 89-08.*

Resolution of Standard Content Open Item 10.1-1

In a letter dated July 16, 2009, the VEGP applicant addressed Open Item 10.1-1 by proposing to include the FAC program as part of License Condition 6, "Operational Program Readiness." Specifically, the applicant stated that in a future application revision License Condition 6 will include the requirement to submit a FAC program implementation schedule, including the construction phase activities. The proposed license condition is consistent with SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria." The staff verified that this change was incorporated into Revision 2 of the COL application. As a result, Open Item 10.1-1 is resolved.

Resolution of Standard Content Confirmatory Item 10.1-1

In a letter dated September 9, 2009, the BLN applicant revised the May 26, 2009, response to RAI 10.3.6-2 related to preservice inspection. The letter clarified that the CHECWORKS Pass 1 analysis (corrosion rates based on the plant model) would be performed for locations with both low and high FAC susceptibility. In addition, the response stated that the Pass 2 analysis (use of inspection data for model refinement, corrosion measurement, and trending) will be performed for high-susceptibility locations if warranted by the Pass 1 analysis. The original response stated that the Pass 2 analysis "will be considered" for high-susceptibility locations. The response includes the following revised wording in FSAR Section 10.1.3.1:

> *The FAC program obtains actual thickness measurements for highly susceptible FAC locations for new lines as defined in EPRI NSAC-202L-R3 (Reference 201). At a minimum, a CHECWORKS type Pass 1 analysis is used for low and highly susceptible FAC locations and a Pass 2 analysis is used for highly susceptible FAC locations when Pass 1 results warrant.*

The staff determined that this revised FSAR text is acceptable because it clarified how the plant predictive model is used to perform FAC analysis, and the approach conforms to the EPRI NSAC-202L guidelines. The VEGP applicant has endorsed the standard RAI responses, and has incorporated the associated changes into Revision 2 of the FSAR. The staff determined that the VEGP applicant has fully addressed all RAI responses, and as a result, Confirmatory Item 10.1-1 is now resolved.

10.1.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff finds the following license condition proposed by the applicant acceptable:

- License Condition (10-1) – Prior to initial fuel load, the licensee shall implement the flow accelerated corrosion (FAC) program including construction phase activities. No later than 12 months after issuance of the COL, the licensee shall submit to the Director of the Office of New Reactors (NRO) a schedule that supports planning for and conduct of NRC inspections of the FAC program implementation including construction phase activities. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the FAC program has been fully implemented.

10.1.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to FAC, and there is no outstanding information to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the information presented in the VCSNS COL FSAR is acceptable because it meets the acceptance criteria provided in Section 10.3.6 of NUREG-0800 and the guidance in GL 89-08. The staff based its conclusion on the following:

- STD COL 10.1-1, relating to the monitoring of the FAC program, is acceptable because it conforms to the acceptance criteria and guidelines provided under Section 10.3.6 of NUREG-0800 and GL 89-08.

10.2 Turbine-Generator

10.2.1 Introduction

The T-G includes the turbine generator system (TGS), associated equipment (including moisture separation), use of extraction steam for feedwater heating, and control functions. Details of TGS component construction materials are included in the AP1000 DCD. The T-G control and overspeed system is described in detail in the DCD; including redundancy and diversity of controls, types of control utilized, overspeed setpoints, and valve actions required for each set point. Because turbine rotors have large masses and rotate at relatively high speeds during normal reactor operation, failure of a rotor may cause excessive vibration of the turbine rotor assembly and result in the generation of high energy missiles. Measures taken by the applicant to ensure turbine rotor integrity and reduce the probability of turbine rotor failure are included in this section of the application.

10.2.2 Summary of Application

Section 10.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 10.2 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 10.2, the applicant provided the following:

Supplemental Information

- STD Supplement (SUP) 10.2-1

The applicant provided supplemental information in VCSNS COL FSAR Section 10.2.2, "System Description," which describes the probability of generating a turbine missile.

- STD SUP 10.2-2

In Revision 0 of the VCSNS COL FSAR, the applicant provided supplemental information regarding the main steam stop and control valves. This supplemental information was deleted in a later revision of the VCSNS COL FSAR; this is discussed in Section 10.2.4 (Technical Evaluation) of this SER.

- STD SUP 10.2-3

The applicant provided supplemental information in VCSNS COL FSAR Section 10.2.3.6, "Maintenance and Inspection Program Plan," which describes the ISI program for the turbine assembly.

- STD SUP 10.2-4

The applicant provided supplemental information in VCSNS COL FSAR Section 10.2.2, "System Description," which describes the turbine assembly preoperational and startup tests.

- STD SUP 10.2-5

The applicant provided supplemental information in VCSNS COL FSAR Section 10.2.3, "Turbine-Rotor Integrity," which describes the turbine assembly operations and maintenance procedures.

AP1000 COL Information Item

- STD COL 10.2-1

The applicant provided additional information in STD COL 10.2-1, which states that a turbine maintenance and inspection program will be submitted to the NRC for review prior to initial fuel load. This addresses the COL information item in Section 10.2.6, "Combined License Information on Turbine Maintenance and Inspection," of the AP1000 DCD (COL Action Item 10.5-2).

License Condition

- License Condition 2, Item 10.2-1, relating to the turbine maintenance and inspection program

10.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for turbine rotor integrity are given in Sections 10.2 and 10.2.3 of NUREG-0800.

10.2.4 Technical Evaluation

The NRC staff reviewed Section 10.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the T-G. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 10.2.4 of the VEGP SER:

Supplemental Information

- *STD SUP 10.2-1*

The applicant provided supplemental information as part of the BLN COL FSAR regarding the probability of generating a turbine missile. In FSAR Section 10.2.2, "System Description," the applicant stated that Section 3.5.1.3 addresses the probability of generation of a turbine missile for AP1000 plants in a side-by-side configuration. The staff's review of the acceptability of the probability of generating a turbine missile is documented in Section 3.5.1, "Missile Selection and Description," of this SER.

- *STD SUP 10.2-2*

In Revision 0 of the BLN COL FSAR, the applicant provided supplemental information regarding the frequency for exercising the main steam stop and control valves. However, the valve exercise frequency is specified in Revision 17 of the DCD, and therefore, this supplemental information is no longer necessary. In Revision 1 of BLN COL FSAR, this information is no longer provided.

- *STD SUP 10.2-3*

The applicant provided supplemental information as part of the BLN COL FSAR regarding the ISI program for the turbine assembly. The applicant added text to

the end of Section 10.2.3.6 of the AP1000 DCD, Revision 17, to describe the breadth of the turbine assembly ISI program.

The NRC staff reviewed the standard supplemental information provided in STD SUP 10.2-3 regarding the text added to Section 10.2.3.6 related to the turbine assembly ISI program. The staff concludes that STD SUP 10.2-3 is acceptable because it is a statement of the scope of the turbine ISI program consistent with the acceptance criteria of Section 10.2.3 of NUREG-0800.

- *STD SUP 10.2-4*

The applicant provided supplemental information as part of the FSAR regarding the turbine assembly preoperational and startup tests. The NRC staff reviewed the standard supplemental information provided in STD SUP 10.2-4 regarding the text added to Section 10.2.2 related to the turbine assembly preoperational and startup testing. The staff determined that this additional information provides further clarity regarding the turbine system startup tests. This additional information does not affect the design aspects of the system or its regulatory basis.

- *STD SUP 10.2-5*

The applicant provided supplemental information as part of the BLN COL FSAR regarding turbine assembly operations and maintenance procedures. The applicant added text to the end of Section 10.2.3 of the AP1000 DCD, Revision 17, to note that operations and maintenance procedures mitigate potential degradation mechanisms in the turbine rotor and buckets/blades. STD SUP 10.2-5 is a general statement about the purpose of operations and maintenance procedures and does not affect those procedures that are part of the staff's review of Section 10.2.3 of the DCD application.

<u>AP1000 COL Information Item</u>

- *STD COL 10.2-1*

The applicant provided additional information (STD COL 10.2-1) in BLN COL FSAR Section 10.2.6, "Combined License Information on Turbine Maintenance and Inspection," to resolve a COL information item identified in AP1000 DCD, Section 10.2.6. STD COL 10.2-1 identifies the turbine maintenance and inspection program, plant-specific turbine rotor test data, and plant-specific calculated toughness curves as items that must be submitted by the COL holder to the NRC staff for review prior to fuel load.

The AP1000 COL information item identified in DCD Section 10.2.6 states:

> *The Combined License holder will submit to the NRC staff for review prior to fuel load and then implement a turbine maintenance and inspection program. The program will be consistent with the maintenance and inspection program plan activities and inspection intervals identified in Subsection 10.2.3.6. The Combined License holder will have available plant-specific*

turbine rotor test data and calculated toughness curves that support the material property assumptions in turbine rotor analysis after the fabrication of the turbine and prior to fuel load.

BLN COL FSAR Section 10.2.6, "Combined License Information on Turbine Maintenance and Inspection," replaces Section 10.2.6 of the AP1000 DCD with the following:

A turbine maintenance and inspection program will be submitted to the NRC staff for review prior to fuel load. The program will be consistent with the maintenance and inspection program plan activities and inspection intervals identified in DCD Subsection 10.2.3.6. Plant-specific turbine rotor test data and calculated toughness curves that support the material property assumptions in the turbine rotor analysis will be available for review after fabrication of the turbine and prior to fuel load.

The applicant proposed License Condition 2, Item 10.2-1 related to the above. The staff is currently reviewing Revision 17 of the DCD which contains the turbine maintenance and inspection program elements. License Condition 2 provides that the applicant will submit, prior to fuel load, its turbine maintenance and inspection program for the as-built rotor, including its material properties. The staff finds this condition acceptable because the inspection program, updated with as-built information, will be submitted to verify consistency with the maintenance and inspection program plan activities and inspection intervals identified in Section 10.2.3.6 of the DCD.

10.2.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff finds the following license condition proposed by the applicant acceptable:

- License Condition (10-2) – Prior to initial fuel load, the licensee shall implement a turbine maintenance and inspection program, which will be consistent with the maintenance and inspection program plan activities and inspection intervals identified in FSAR Section 10.2.3.6. No later than 12 months after issuance of the COL, the licensee shall submit to the Director of NRO a schedule that supports planning for and conduct of NRC inspections of the turbine maintenance and inspection program. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the turbine maintenance and inspection program has been fully implemented.

10.2.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the T-G, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the acceptance criteria of Section 10.2 of NUREG-0800. The staff based its conclusions on the following:

- STD SUP 10.2-1, related to the probability of generating a turbine missile, is reviewed by the staff in Section 3.5.1, "Missile Selection and Description," of this SER.

- STD SUP 10.2-2, related to frequency for exercising the main steam stop and control valves, was deleted in Revision 1 of the VCSNS COL FSAR.

- STD SUP 10.2-3, related to the ISI program for the turbine assembly, is acceptable to the staff because the description of the ISI program is consistent with Section 10.2.3 of NUREG-0800.

- STD SUP 10.2-4, relating to the turbine assembly preoperational and startup tests, is acceptable to the staff because the proposed valve testing is consistent with the guidance in Section 10.2 of NUREG-0800.

- STD SUP 10.2-5, relating to mitigation of potential degradation mechanisms for the turbine rotor and buckets/blades, is acceptable to the staff because it is a general statement about the purpose of operations and maintenance procedures and does not affect those procedures that are part of the staff's review of Section 10.2.3 of the DCD application.

- STD COL 10.2-1, relating to the turbine maintenance and inspection program, is acceptable to the staff because the applicant proposed a license condition that appropriately addresses this information item.

10.3 Main Steam Supply System

10.3.1 Introduction

The main steam supply system (MSSS) transports the steam generated by the nuclear steam supply system to the S&PC system and various non-safety-related auxiliaries. Portions of the MSSS are used as part of the heat sink that removes heat from the reactor facility during certain operations. The MSSS for the pressurized-water reactor (PWR) plant extends from the connections to the secondary sides of the SGs up to and including the turbine stop valves.

10.3.2 Summary of Application

Section 10.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 10.3 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 10.3, the applicant provided the following:

Supplemental Information

- STD SUP 10.3-1

The applicant provided supplemental information in VCSNS COL FSAR Section 10.3.2.2.1, "Main Steam Piping," which addresses operations and maintenance procedures.

- STD SUP 10.3-2

The applicant provided supplemental information in VCSNS COL FSAR Section 10.3.5.4, "Chemical Addition," related to secondary-side water chemistry.

- STD SUP 10.3-3

The applicant provided supplemental information in VCSNS COL FSAR Section 10.3.6.2, "Material Selection and Fabrication," which addresses intergranular stress corrosion cracking (IGSCC).

10.3.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the MSSS are given in Sections 10.3.1 and 10.3.6 of NUREG-0800.

The applicable regulatory requirements and guidance for STD SUP 10.3-1, STD SUP 10.3-2, and STD SUP 10.3-3 are as follows:

- General Design Criterion (GDC) 4, "Environmental and Dynamic Effects Design Bases"

- Regulatory Guide (RG) 1.37, Revision 1, "Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components of Water-Cooled Nuclear Power Plants"

- Branch Technical Position (BTP) 5-1, "Monitoring of Secondary Side Water Chemistry in PWR Steam Generators"

The regulatory basis for acceptance of the supplemental information on controls to prevent stress-corrosion cracking of stainless steels and nickel alloys is the quality assurance requirements in Appendix B, "Quality assurance criteria for nuclear power plants and fuel reprocessing plants," of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic licensing of production and utilization facilities," and the guidance in RG 1.37, as they relate to quality assurance requirements for the design, fabrication, and construction of safety-related structures, systems, and components (SSCs).

10.3.4 Technical Evaluation

The NRC staff reviewed Section 10.3 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the MSSS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 10.3.4 of the VEGP SER:

> *Supplemental Information*
>
> - *STD SUP 10.3-1*
>
> *The applicant provided additional information as part of the BLN COL FSAR regarding operations and maintenance procedures. The applicant added text to Section 10.3.2.2.1 of the AP1000 DCD, Revision 17, to address steam hammer and relief valve discharge reaction loads.*
>
> *The NRC staff reviewed the standard supplemental information provided in STD SUP 10.3-1 regarding the text added to Section 10.3.2.2.1 related to MSSS operations and maintenance procedures.*

During its review of Revision 0 of the BLN COL FSAR, the staff did not find any further details regarding these procedures. Therefore, the staff raised a concern regarding the adequacy of these procedures. Also, Section 10.3 of NUREG-0800, "MAIN STEAM SUPPLY SYSTEM," Item II, related to GDC 4, describes that the main steam system should adequately consider water (steam) hammer and relief valve discharge loads to assure that system safety functions can be performed and should assure that operating and maintenance procedures include adequate precautions to prevent water (steam) hammer and relief valve loads. In order to ensure the adequacy of the MSSS and its agreement with the NUREG-0800 criteria, the staff requested the key elements of the procedures for staff's review in RAI 10.3-1.

In its response, dated July 21, 2008, concerning precluding or mitigating water hammer events, the applicant identified that good operating practice and operating experience including, but not limited to Institute of Nuclear Power Operations (INPO) significant event reports and significant operating event reports, NRC information notices and bulletins, and other industry operating experience information are programmatically integrated into the AP1000 Operations Procedure development. The applicant also stated that specific operating experience to preclude or mitigate water hammer is included in this population of operating experience. In addition, the applicant explained that the AP1000 has been designed to prevent or minimize steam and water hammer. The applicant stated that BLN COL FSAR Section 10.3.2.2.1 will be revised to include additional precautions, when appropriate, to minimize the potential for steam and water hammer.

With respect to the relief valve discharge loads, in its response, the applicant explained that Westinghouse addressed these loads for main steam safety valves in the AP1000 DCD, Section 10.3.2.2.2, "Main Steam Safety Valves," which BLN incorporated by reference with no departures and supplements. Further, the applicant stated that as described in NUREG-0927, Revision 1, "Evaluation of Water Hammer Occurrence in Nuclear Power Plants," preventive measures for relief valve loading are addressed by design. Therefore, the applicant stated that the COL application Part 2, BLN COL FSAR Section 10.3.2.2.1 will be revised to remove the associated procedure precautions as related to the relief valve discharge reaction loading. In addition, Section 10.3.2.2.1 will be revised to state that operations and maintenance procedures include precautions, when appropriate, to minimize the potential for steam and water hammer. The applicant listed several precautionary items, such as: prevention of rapid valve motion, process for avoiding voids and flashing in water-filled lines and venting these lines, process for avoiding introduction of water into steam lines and proper warm-up and drainage of these lines, and effects of valve alignments on line conditions.

Based on its review, the staff finds the applicant's response acceptable because a detailed list of the procedural precautions (identified above) is provided and included as a proposed revision to COL application Part 2, BLN COL FSAR Section 10.3.2.2.1. The staff reviewed the precautions and compared them to the industry experience and staff guidance, and finds that they adequately address steam and water hammer. Therefore, the staff agrees that the deletion of the relief valve discharge reaction load occurrences from BLN COL FSAR

Section 10.3.2.2.1 is acceptable, because its discussion was already identified in the AP1000 DCD Section 10.3.2.2.1. In BLN COL FSAR Section 10.3.2.2.1, Revision 1, the applicant revised STD SUP 10.3-1 as indicated above in its response to RAI 10.3-1. Therefore, the staff's concern in RAI 10.3-1 is resolved.

- *STD SUP 10.3-2*

The applicant provided additional information as part of the BLN COL FSAR regarding the secondary chemistry. In FSAR Section 10.3.5.4, "Chemical Addition," the applicant proposed adding the following at the end of DCD Subsection 10.3.5.4:

> *Alkaline chemistry supports maintaining iodine compounds in their nonvolatile form. When iodine is in its elemental form, it is volatile and free to react with organic compounds to create organic iodine compounds, which are not assumed to remain in solution. It is noted that no significant level of organic compounds is expected in the secondary system. The secondary water chemistry, thus, does not directly impact the radioactive iodine partition coefficients.*

The staff reviewed the secondary water chemistry under Section 10.4.6 of this SER and found it acceptable with respect to the EPRI PWR Secondary Water Chemistry Guidelines. As discussed in Section 10.4.6, the staff considers application of the guidance of the EPRI PWR Secondary Water Chemistry Guidelines, and a programmatic commitment to use these guidelines, to be an acceptable method for the applicant to ensure compliance with GDC 14 as it relates to ensuring the integrity of the reactor coolant boundary (specifically, as the secondary water chemistry program ensures the integrity of the SG tubing). As the applicant stated in STD SUP 10.3-2, the secondary water chemistry does not directly impact the iodine partition coefficients. In addition, radioactive iodine is not a consideration in the EPRI Secondary Water Chemistry Guidelines. The staff finds that STD SUP 10.3-2 is a statement of fact that does not affect the staff's review. The management of radioactive compounds, including iodine, is addressed by the staff in Chapter 11.

- *STD SUP 10.3-3*

The applicant provided additional information as part of the BLN COL FSAR regarding IGSCC. The applicant added text to the end of Section 10.3.6.2 "Material Selection and Fabrication" of the AP1000 DCD, Revision 17, to include providing the necessary controls to minimize the susceptibility of components made of stainless steel and nickel-based materials to IGSCC. The applicant proposed adding the following at the end of DCD Section 10.3.6.2:

> *Appropriate operations and maintenance procedures provide the necessary controls during operation to minimize the susceptibility of components made of stainless steel and nickel-based materials to IGSCC by controlling chemicals that are used on system components.*

The staff finds the supplemental information, addressing IGSCC concerns related to stainless steels and nickel-base alloys, acceptable because the AP1000 DCD meets the technical guidelines specified in RG 1.37. In addition, the staff notes that these materials are not proposed for use in the main steam and feedwater piping systems at BLN Units 3 and 4.

Correction of Error in the Standard Content Evaluation Text

The NRC staff identified an error in the text reproduced above from the BLN SER, Section 10.3.4, that requires correction. The BLN SER states that the staff reviewed the secondary water chemistry in Section 10.4.6 of the SER. Secondary water chemistry is actually reviewed in Section 10.4.7 of the SER.

10.3.5 Post Combined License Activities

There are no post-COL activities related to this section.

10.3.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to MSSS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the requirements of Appendix A to 10 CFR Part 50, GDC 4, 10 CFR 52.79, "Contents of applications; technical information in final safety analysis report," and the guidance in Sections 10.3 and 10.3.6 of NUREG-0800, BTP 5-1, and RG 1.37. The staff based its conclusions on the following:

- STD SUP 10.3-1, relating to operations and maintenance procedures, is acceptable because the applicant provided sufficient information to satisfy GDC 4 as related to MSSS design considering the water (steam) hammer effects on the safety-related SSCs.

- STD SUP 10.3-2, relating to secondary chemistry, is a statement of fact that does not affect the staff's review.

- STD SUP 10.3-3, relating to IGSCC, is acceptable to the staff because the AP1000 DCD meets the technical guidelines specified in RG 1.37.

10.4 Other Features of Steam and Power Conversion System

10.4.1 Main Condensers

During normal operation, the main condenser receives, condenses and deaerates exhaust steam from the main turbine and the turbine bypass system whenever the turbine bypass system is operated. The main condenser is also a collection point for other steam cycle miscellaneous drains and vents.

Section 10.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 10.4.1of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

10.4.2 Main Condenser Evacuation System

10.4.2.1 *Introduction*

Main condenser evacuation is performed by the condenser air removal system. The system removes noncondensable gases and air from the main condenser during plant startup, cooldown, and normal operation. This action is performed by liquid ring vacuum pumps.

10.4.2.2 *Summary of Application*

Section 10.4 of the VCSNS COL FSAR, Revision 5 incorporates by reference Section 10.4 of the AP1000 DCD, Revision 19. Section 10.4 of the DCD includes Section 10.4.2.2.

In addition, in VCSNS COL FSAR Section 10.4.2.2, the applicant provided the following:

Site-Specific Information Replacing Conceptual Design Information

- VCS CDI

The applicant provided additional information to replace conceptual design information (CDI) in VCSNS COL FSAR Section 10.4.2.2.1, "General Description," which describes the plant-specific cooling water source for the vacuum pump seal water heat exchangers.

- VCS CDI

The applicant provided additional information to replace CDI in VCSNS COL FSAR Section 10.4.2.2.2, "Component Description," which describes the plant-specific tube side water flow in the seal water heat exchangers.

10.4.2.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

Additional regulatory basis is Appendix A to 10 CFR Part 50 and GDC 60, "Control of Releases of Radioactive Materials to the Environment."

Acceptance criteria associated with the relevant requirements of the Commission regulations for the main condenser evacuation system are given in Section 10.4.2 of NUREG-0800.

10.4.2.4 *Technical Evaluation*

The NRC staff reviewed Section 10.4.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the main condenser evacuation system. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff's review of this application is limited to the following VCSNS plant-specific design information that replaces the CDI identified in the AP1000 DCD:

Site-Specific Information Replacing Conceptual Design Information

- VCS CDI

The VCSNS plant-specific design information was annotated as "VCS CDI" in VCSNS COL FSAR Section 10.4.2. In this section, the applicant replaced bracketed (conceptual design) text in Sections 10.4.2.2.1, "General Description," and 10.4.2.2.2, "Component Description," of the AP1000 DCD to provide specific information regarding the sources of cooling water for the vacuum pump seal water heat exchangers.

The VCS CDI in VCSNS COL FSAR Section 10.4.2.2.1 is related to the CWS and raw water system (RWS) supplying cooling water for the main condenser vacuum pump seal water heat exchangers. The VCS CDI in FSAR Section 10.4.2.2.2 clarifies that the seal water flows through the shell side of the seal water heat exchanger and CWS water flows through the tube side. Based on its review, the staff concludes that this VCSNS plant-specific design information will have no adverse affects on the capability of the main condenser evacuation system, CWS, or RWS and associated equipment. Also, the staff concludes that adding this VCSNS plant-specific design information will not affect the functions of any safety-related equipment, components, or systems of the plant. The staff accepts these revisions as stated, because the information provided in this VCS CDI meets the acceptance criteria in Section 10.4.2 of NUREG-0800, and therefore, meets GDC 60 as it relates to the main condenser evacuation system design for the control of releases of radioactive materials to the environment.

10.4.2.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

10.4.2.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the main condenser evacuation system, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the acceptance criteria of Section 10.4.2 of NUREG-0800 and the requirements of GDC 60. The staff based its conclusions on the following:

- VCS CDI, relating to VCSNS COL FSAR Section 10.4.2.2.1, "General Description," concerning cooling water source for the vacuum pump seal water heat exchanger, is acceptable to the staff because it meets GDC 60 for the control of releases of radioactive materials to the environment.

- VCS CDI, relating to VCSNS COL FSAR Section 10.4.2.2.2, "Component Description," concerning the tube side water flow in the seal water heat exchangers, is acceptable to the staff because it meets GDC 60 for the control of releases of radioactive materials to the environment.

10.4.3 Gland Sealing System (Related to RG 1.206, Section C.III.1, Chapter 10, C.I.10.4.3, "Turbine Gland Sealing System")

The gland seal system prevents the escape of steam from the turbine shaft, turbine casing penetrations, and valve stems. The gland seal system also prevents air in-leakage through sub-atmospheric turbine glands. The system provides a source of sealing steam to the annulus space where the turbine and large steam valve shafts penetrate the turbine casings.

Section 10.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 10.4.3 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

10.4.4 Turbine Bypass System

The turbine bypass system provides the capability to discharge main steam from the steam generators directly to the main condenser, which minimizes load transient effects on the nuclear steam supply system. The turbine bypass system is designed to discharge a certain percentage of rated main steam flow directly to the main condenser, bypassing the turbine. The system is also used to discharge main steam during reactor hot standby and cooldown operations.

Section 10.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 10.4.4 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

10.4.5 Circulating Water System

10.4.5.1 *Introduction*

The CWS removes waste heat from the main condenser. This waste heat is subsequently transferred to the power cycle heat sink. The CWS provides a continuous supply of cooling water to the main condenser to remove the heat rejected by the turbine cycle and auxiliary systems.

10.4.5.2 *Summary of Application*

Section 10.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 10.4 of the AP1000 DCD, Revision 19. Section 10.4 of the DCD includes Section 10.4.5.

In addition, in VCSNS COL FSAR Section 10.4.5, the applicant provided the following:

AP1000 COL Information Item

- VCS COL 10.4-1

The applicant provided additional information related to the CWS design parameters in VCS COL 10.4-1 to resolve the COL information item in Section 10.4.12.1 of the AP1000 DCD (COL Action Item 10.5-3).

Site-Specific Information Replacing Conceptual Design Information

- VCS CDI

The applicant provided additional information to replace CDI in VCSNS COL FSAR Section 10.4.5, which describes the following various aspects of the site-specific CWS:

- Power generation design basis
- General description
- Component description
- System operation
- Tests and inspections
- Instrumentation applications

10.4.5.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the regulatory basis for acceptance of COL Information Item 10.4-1 (COL Action Item 10.5-3) is established in GDC 4, as it relates to design provisions provided to accommodate the effects of discharging water that may result from a failure of a component or piping in the CWS.

In accordance with Section 10.4.5 of NUREG-0800, the requirements of GDC 4 are met when the CWS design includes provisions to accommodate the effects of discharging water that may result from a failure of a component or piping in the CWS. Means should be provided to prevent

or detect and control flooding of safety-related areas so that the intended safety function of a system or component will not be precluded due to leakage from the CWS. Malfunction or a failure of a component or piping of the CWS, including an expansion joint, should not have unacceptable adverse effects on the functional performance capabilities of safety-related systems or components.

10.4.5.4 *Technical Evaluation*

The NRC staff reviewed Section 10.4.5 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the CWS. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

AP1000 COL Information Items

- VCS COL 10.4-1

In VCSNS COL FSAR Section 10.4.5, the applicant provided additional information in VCS COL 10.4-1 to resolve the COL information item in Section 10.4.12.1, "Circulating Water System," of the AP1000 DCD, which states:

> The Combined License applicant will address the final configuration of the plant circulating water system including piping design pressure, the cooling tower or other site-specific heat sink.
>
> As applicable, the Combined License applicant will address the acceptable Langelier or Stability Index range, the specific chemical selected for use in the CWS water chemistry control, pH adjuster, corrosion inhibiter, scale inhibiter, dispersant, algaecide and biocide applications reflecting potential variations in site water chemistry and in micro macro biological life forms. A biocide such as sodium hypochlorite is recommended. Toxic gases such as chlorine are not recommended. The impact of toxic gases on the main control room habitability is addressed in Section 6.4. The Combined License applicant will also be responsible for the design, routing, and disposition requirements associated with the main condenser waterbox drains.

This item was also captured as COL Action Item 10.5-3 in Appendix F of NUREG-1793:

> The COL applicant is responsible for the site-specific configuration of the plant circulating water system (including piping design pressure), the cooling tower, or other site-specific heat sink.

The applicant addressed the above COL information item of the AP1000 DCD in VCSNS COL FSAR Sections 10.4.5.2.1, "General Description"; 10.4.5.2.2, "Component Description"; and 10.4.5.5, "Instrumentation Applications"; by providing additional information concerning

CWS heat sink capability, design parameters, cooling towers, waterbox drains, and CWS water chemistry control. The staff reviewed the applicant's information in these FSAR sections.

In VCSNS COL FSAR Section 10.4.5.2.1, the applicant described the VCSNS site-specific CWS. The CWS and the cooling towers provide a heat sink for waste heat exhausted from the main steam turbine. Also, to address COL Information Item 10.4-1 of the AP1000 DCD, the applicant provided VCSNS-specific design parameters in VCSNS COL FSAR Table 10.4-202, "Supplemental Design Parameters for Major Circulating Water System Components."

In VCSNS COL FSAR Section 10.4.5.2.2, the applicant stated that the design pressure of the condenser portions of the piping is identified in AP1000 DCD Table 10.4.1-1, "Main Condenser Design Data," and the design pressure of the remaining piping is 100 pounds per square inch gauge (psig). The design pressure of the condenser portions of the piping (waterbox design pressure) is identified in the table as 90 psig. The staff finds the design pressure of 100 psig for the remaining piping is compatible with the 90 psig for the condenser portion and is, therefore, acceptable. The staff also reviewed the VCSNS COL FSAR Table 10.4-202 site-specific design parameters and compared them to the corresponding data in AP1000 DCD Table 10.4.5-1, "Design Parameters for Major Circulating Water Components," and finds them acceptable as the site-specific parameters are similar to those for the certified design.

Also in VCSNS COL FSAR Section 10.4.5.2.2, the applicant provided information on the chemical treatment program for the CWS. The applicant stated that specific chemicals used within the system are determined by the site water conditions. Additionally, in VCSNS COL Section 10.4.5.5, the applicant identified that circulating water chemistry is controlled by cooling tower blowdown via regulating the blowdown valve. The staff finds that the applicant adequately addressed COL Information Item 10.4-1 by specifying its site-specific chemicals and control and maintenance of CWS chemistry.

In addition, in VCSNS COL FSAR Section 10.4.5.2.2, the applicant provided information on the design, routing, and disposition requirements associated with the main condenser waterbox drains. The applicant stated that the condenser waterbox drains will drain to the cooling tower basin. Piping is routed from each waterbox to the condenser waterbox drain pump which in turn pumps the water back to the cooling tower. Each waterbox contains drain valves and vents so that a waterbox can be drained individually. Piping is sized to support an adequate drain down in the event of emergency maintenance. The staff finds that the applicant adequately addressed the site-specific design, routing, and disposition requirements associated with the main condenser waterbox drains as specified in COL Information Item 10.4-1.

The staff reviewed the information provided in the above VCSNS COL FSAR sections and finds that the applicant addressed the final configuration of the CWS as specified in the COL Information Item 10.4-1. The staff finds that the CWS design parameters of temperature and flow rates in VCSNS COL FSAR Table 10.4-202 are consistent with the design parameters in AP1000 DCD Table 10.4.5-1. The staff also finds that the design piping pressures of the VCSNS CWS are consistent with the design pressures of the conceptual (non-site-specific) design of the AP1000 CWS, and are, therefore, acceptable.

The staff's evaluation of the CWS final configuration is addressed below under the CDI discussions.

Site-Specific Information Replacing Conceptual Design Information

- VCS CDI

The applicant provided VCSNS site-specific design information as part of the FSAR to replace the CDI in the AP1000 DCD regarding the CWS. The applicant replaced bracketed text throughout Section 10.4.5 of the AP1000 DCD to provide site-specific CWS power generation design basis information, general CWS description, component description, system operation, tests and inspections, and instrumentation applications. The staff reviewed the text added in VCS CDIs throughout VCSNS COL FSAR Section 10.4.5 related to the CWS system, and the following provides the staff's evaluation of these CDIs in the application.

In VCSNS COL FSAR Sections 10.4.5.1, "Design Bases," and 10.4.5.2, "System Description," the applicant provided a description of its CWS system configuration. The CWS is a non-safety-related system. The CWS supplies cooling water to remove heat from the main condensers, the turbine building closed cooling water system heat exchangers and the condenser vacuum pump seal water heat exchangers under varying conditions of power plant loading and design weather conditions.

In VCSNS COL FSAR Section 10.4.5.2.1, "General Description," the applicant provided site-specific design information in that the VCSNS CWS consists of three 33-1/3 percent capacity circulating water pumps. In addition, each pump discharge line has a motor-operated butterfly valve located between the pump discharge and the main header. This permits isolation of one pump for maintenance and allows two-pump operation

In VCSNS COL FSAR Section 10.4.5.2.2, "Component Description," the applicant provided VCSNS-specific design information regarding the CWS major components, such as circulating water pumps, cooling tower, cooling tower makeup and blowdown, and piping and valves, which address the final configuration of the CWS.

The two cooling towers are mechanically induced-draft, counterflow cooling towers. Each cooling tower is designed to cool the water to 90.1 °Fahrenheit (F) (32.3 °Celsius (C)) with a hot water inlet temperature of 114.8 °F (46 °C). The staff finds that the above temperature values are acceptable as they demonstrate an equally effective cooling tower design as listed in AP1000 DCD Table 10.4.5-1. The applicant states that the cooling towers are located to prevent adverse interactions with SSCs required for safe shutdown of the plant in case of collapse of the towers or failure of their basins and flumes. However, the staff could not find further details on how the cooling tower failure will have no affect on the nearby safety-related system, equipment and/or structure of the plant. As described in NUREG-0800, Section 10.4.5, Acceptance Criteria, the requirements of GDC 4 are met when the CWS design includes provisions to accommodate the effects of discharging water that may result from a failure of a component or piping in the CWS. Therefore, in order to meet this GDC 4 criteria and for the NRC staff to complete its evaluation of the site-specific CWS the staff requested, in RAI 10.4.5-1, that the applicant provide additional information to ensure that failure of the tower will not affect the safety-related systems or equipment that are located in the proximity of the cooling tower. In a letter dated February 18, 2009, the applicant responded to RAI 10.4.5-1 by stating that the mechanically induced draft cooling towers are 75 feet tall, and are more than 600 feet away from the closest safety-related building. This physical separation will prevent any interactions of a failed cooling tower and safety-related buildings. The site is graded to direct water that may result from a cooling tower failure or a circulating water yard piping failure away from the nuclear islands. The consequences of these failures are bounded by a failure of

circulating water piping in the turbine building. The staff finds that the applicant has provided adequate information to satisfy GDC 4 with respect to external flooding events due to CWS failures. The staff verified that the applicant incorporated the associated changes in the VCSNS COL FSAR.

Regarding internal flooding, in VCSNS COL FSAR Section 10.4.5.2.3, "System Operation," the applicant incorporates by reference, text from the AP1000 DCD, which states "The effects of flooding due to a circulating water system failure, such as the rupture of an expansion joint, will not result in detrimental effects on safety-related equipment since there is no safety-related equipment in the turbine building and the base slab of the turbine building is located at grade elevation. Water from a system rupture will run out of the building through a relief panel in the turbine building west wall before the level could rise high enough to cause damage." Site grading will carry the water away from safety-related buildings. The staff finds that a malfunction or a failure of a component or piping of the CWS, including an expansion joint, will not have unacceptable adverse effects on the functional performance capabilities of safety-related systems or components. Therefore, the GDC 4 requirements have been satisfied since the flooding that results from failure of the CWS does not adversely impact any safety-related SSCs.

Further, the staff finds that the CWS cooling tower makeup is provided by the RWS, described in VCSNS COL FSAR Section 9.2.11, "Raw Water System." Makeup to and blowdown from the CWS is controlled by the makeup and blowdown control valves. The evaluation of RWS capabilities is provided in Section 9.2.11 of this SER.

The underground portions of the CWS piping are constructed of prestressed concrete pressure piping. The remainder of the piping is carbon steel and is coated internally with a corrosion-resistant compound. Control valves provide regulation of cooling tower blowdown and makeup. The CWS is designed to withstand the maximum operating discharge pressure of the circulating water pumps. As discussed earlier in the staff evaluation of VCS COL 10.4-1, the staff finds the CWS piping design pressure of 100 psig to be compatible with the condenser and associated equipment design, and therefore, acceptable.

In VCSNS COL FSAR Section 10.4.5.2.3, "System Operation," the applicant stated that if the circulating water pumps, the cooling tower, or the circulating water piping malfunction and the condenser is not available to adequately support unit operation, cooldown of the reactor may be accomplished by using the power-operated atmospheric steam relief valves or safety valves rather than the turbine bypass system. The staff finds that this alternate cooldown method is acceptable, because the turbine bypass system will not function during accident conditions and the CWS is not required for safe shutdown following an accident. Further, the applicant stated that circulating water flow to the cooling towers can be diverted directly to the basins, bypassing the cooling towers' internals, by opening the bypass valves during plant startup or partial load or to maintain CWS temperatures above 40 °F (4.4 °C). The staff finds that these provisions of the site-specific CWS design meet the requirements of GDC 4, as described in NUREG-0800, Section 10.4.5.

In VCSNS COL FSAR Section 10.4.5.5, "Instrumentation Application," the applicant identifies the configuration and function of the CWS pressure, temperature and level instrumentation at the VCSNS site. Also, the motor-operated valve at each pump discharge is interlocked with the pump, so that the pump trips if the discharge valve fails to reach the full-open position shortly after starting the pump.

Based on its review of the information provided by the applicant, the staff concludes that the site-specific design of the VCSNS CWS (VCS CDI) provided in the VCSNS COL FSAR sections above adequately addresses the information that was specified in the AP1000 DCD.

10.4.5.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

10.4.5.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the CWS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, VCS CDI involving the CWS is adequately addressed by the applicant. The staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the acceptance criteria of Section 10.4.5 of NUREG-0800 and the requirements of GDC 4. The staff based its conclusions on the following:

- VCS COL 10.4-1, relating to the final configuration of the circulating water, is acceptable to the staff because the applicant addressed the site-specific chemicals and control and maintenance of the CWS chemistry in order to be consistent with AP1000 DCD.

- VCS CDI, relating to various aspects of the CWS, is acceptable to the staff because failure of the site-specific CWS design does not adversely impact any safety-related SSCs.

10.4.6 Condensate Polishing System (Related to RG 1.206, Section C.III.1, Chapter 10, C.I.10.4.6, "Condensate Cleanup System")

The condensate polishing system can be used to remove corrosion products and ionic impurities from the condensate system during plant startup, hot standby, power operation with abnormal secondary cycle chemistry, safe shutdown, and cold shutdown operations.

Section 10.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 10.4.6 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

10.4.7 Condensate and Feedwater System

10.4.7.1 *Introduction*

The condensate and feedwater system provides feedwater at the required temperature, pressure, and flow rate to the SGs. Condensate is pumped from the main condenser hot well

by the condensate pumps, passes through the low-pressure feedwater heaters to the feedwater pumps, and then is pumped through the high-pressure feedwater heaters to the SGs.

10.4.7.2 *Summary of Application*

Section 10.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 10.4 of the AP1000 DCD, Revision 19. Section 10.4 of the DCD includes Section 10.4.7.

In addition, in VCSNS COL FSAR Section 10.4.7.2.1, the applicant provided the following:

AP1000 COL Information Item

- VCS COL 10.4-2

The applicant provided additional information in VCS COL 10.4-2 to address the COL information item in Section 10.4.12.2, "Condensate, Feedwater and Auxiliary Steam System Chemistry Control," of the AP1000 DCD (COL Action Item 10.5-4).

Supplemental Information

- STD SUP 10.4-1

The applicant provided supplemental information in VCSNS COL FSAR Section 10.4.7.2.1, "General Description," which addresses operations and maintenance procedures.

- STD SUP 10.4-2

The applicant provided supplemental information, which states that the EPRI Secondary Water Chemistry Guidelines will be used for guidance on selection of pH control agents and pH optimization as described in Nuclear Energy Institute (NEI) 97-06, "Steam Generator Program Guidelines."

10.4.7.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the regulatory basis for acceptance of the COL information item and STD SUP 10.4-2 is GDC 14, as it relates to ensuring the integrity of the reactor coolant pressure boundary (specifically as the secondary water chemistry program ensures the integrity of the SG tubing). The applicable acceptance criteria for meeting GDC 14 are found in NUREG-0800 Sections 10.4.6 and 5.4.2.1, including BTP 5-1. The regulatory basis for acceptance of STD SUP 10.4-1 is established in GDC 4, insofar as it requires that the dynamic effects associated with possible fluid flow instabilities (e.g., water hammers) during normal plant operation, as well as during upset or accident conditions be considered, and that SSCs important to safety be designed to accommodate the effects of, and be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents.

GDC 4 can be complied with by meeting the relevant acceptance criteria specified in Section 10.4.7 of NUREG-0800, "Condensate and Feedwater System." In regard to fluid

instabilities, the requirements of GDC 4, as related to protecting SSCs against the dynamic effects associated with possible fluid flow instabilities (e.g., water hammers) during normal plant operation, as well as during upset or accident conditions can be met by: (1) meeting the guidance in BTP 10-2, "Design Guidelines for Avoiding Water Hammers in Steam Generators," for reducing the potential for water hammers in SGs; and (2) meeting the guidance related to feedwater-control-induced water hammer. Guidance for water hammer prevention and mitigation is given in NUREG-0927, Revision 1.

10.4.7.4 *Technical Evaluation*

The NRC staff reviewed Section 10.4.7 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the condensate and feedwater system. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The staff reviewed the information in the VCSNS COL FSAR:

AP1000 COL Information Item

- VCS COL 10.4-2

In VCSNS COL FSAR Section 10.4.7.2.1, the applicant provided additional information in VCS COL 10.4-2 to address the COL information item in Section 10.4.12.2, "Condensate, Feedwater and Auxiliary Steam System Chemistry Control," of the AP1000 DCD, which states:

> The Combined License applicant will address the oxygen scavenging agent and pH adjuster selection for the turbine island chemical feed system.

The commitment was also captured as COL Action Item 10.5-4 in Appendix F of NUREG-1793:

> The COL applicant is responsible for chemistry control of the condensate, feedwater, and auxiliary steam system.

The VCSNS COL FSAR modified Section 10.4.7.2.1 of the AP1000 DCD, to state:

> The oxygen scavenger agent is hydrazine and the pH control agent is morpholine.

The NRC staff reviewed the resolution to VCS COL 10.4-2 regarding the text added to Section 10.4.7.2.1, related to condensate, feedwater, and auxiliary steam system chemistry control.

The description of the secondary water chemistry control program is addressed in the AP1000 DCD, Section 10.3.5. Consistency with industry guidelines was addressed in the AP1000 DCD, Section 10.3.5.5, which stated that action taken when chemistry parameters are outside normal operating ranges will, in general, be consistent with action levels described in Reference 1 ("PWR Secondary Water Chemistry Guidelines," EPRI technical report (TR) TR-102134-R5, March 2000). However, the AP1000 DCD does not specify the oxygen scavenger or pH control chemicals to be used. This is to be addressed by COL Information Item 10.4-2 of the AP1000 DCD.

Revision 6 of the EPRI Secondary Water Chemistry Guidelines (EPRI Guidelines), which is the latest published version of these guidelines, does not require a specific oxygen scavenging agent. However, the guidelines do note that hydrazine is the most commonly used oxygen scavenger for PWR secondary systems and is generally recognized as effective for this purpose. Therefore, the staff finds the identified oxygen scavenger agent is consistent with the EPRI guidelines.

For pH control, the EPRI secondary water chemistry guidelines do not require specific amines. Section 3.3.1 of the EPRI Guidelines recommends a plant-specific amine be selected based on a number of factors. Section 3.3.1 of the EPRI Guidelines lists several amines that have been used or are being used in PWR plants as pH control agents, including morpholine. Section 3.3.1.2 of the EPRI Guidelines states that if implementing advanced amine treatment, a site-specific materials compatibility review will be necessary to ensure that components, particularly elastomers, are compatible with the amine. The EPRI Guidelines, in Table 5-4, "Recirculating Steam Generator Power Operation (≥30% Reactor Power) Feedwater Sample,"

refer to several other EPRI reports for guidance for optimization of the pH in conjunction with the amine selected. The applicant did not explicitly describe how the selected amine was qualified, or how the pH will be optimized in conjunction with the selected amines.

Although the applicant did not explicitly describe how the selected amines were qualified, STD SUP 10.4-2 ensures that the qualification of the chosen oxygen scavenging and pH control chemicals will be consistent with the EPRI PWR Secondary Water Chemistry Guidelines. (See evaluation of STD SUP 10.4-2 below under evaluation of supplemental information).

The staff finds the pH control and oxygen scavenger chemical acceptable because the proposed chemicals will be qualified and the resulting pH optimized following the guidance of the EPRI PWR Secondary Water Chemistry Guidelines, which is referenced in NUREG-0800 as acceptable guidance to ensure that the secondary water chemistry program meets GDC 14. On the basis of the information provided by the applicant and the acceptance criteria in BTP 5-1, the staff concludes that the proposed secondary chemistry that uses hydrazine and morpholine is acceptable.

The following portion of this technical evaluation section is reproduced from Section 10.4.7.4 of the VEGP SER:

Supplemental Information

- *STD SUP 10.4-1*

The applicant provided supplemental information as part of the BLN COL FSAR regarding operations and maintenance procedures. The applicant added the following text to the end of Section 10.4.7.2.1 of the AP1000 DCD, Revision 17*:*

Operations and maintenance procedures include appropriate precautions to avoid steam/water hammer occurrences.

The NRC staff reviewed the standard supplemental information provided in STD SUP 10.4-1 regarding the text added to Section 10.4.7.2.1 related to operations and maintenance procedures.

In Section 10.4.7 of NUREG-0800, Acceptance Criteria 2, provides acceptable methods of compliance with the requirements in GDC 4, as it applies to fluid flow instabilities, (e.g., water hammer). Criteria 2B, "Meeting the guidance related to feedwater-control-induced water hammer," states that guidance for water hammer and mitigation is found in NUREG-0927. The supplemental information added to the BLN COL FSAR states that operations and maintenance procedures include appropriate precautions to avoid steam/water hammer occurrences; however, the supplemental information being proposed by the applicant did not identify what type of precautions included in the procedures minimize the potential for water hammer occurrences. In order to ensure that the procedures adequately address water hammer prevention and mitigation, the staff requested in RAI 10.4-7-1, in a letter dated June 3, 2008, that the applicant provide a more detailed statement concerning the use of operations and maintenance procedures, including information on what specific elements in the procedures (i.e., venting) will result in reduced potential of water hammer occurrences.

In its response, dated July 17, 2008, concerning reducing the potential for water hammer events, the applicant identified that they programmatically integrate into the AP1000 Operations Procedure development good operating practice and operating experience including, but not limited to, Institute of Nuclear Power Operations (INPO) significant event reports and significant operating event reports, NRC information notices and bulletins, and other industry operating experience information. Further, the applicant explained that specific operating experience to preclude or mitigate water hammer is included in this population of operating experience. In addition, the applicant explained that the AP1000 has been designed to prevent or minimize steam and water hammer. The applicant agreed to revise the procedure elements in BLN COL FSAR Section 10.4.7.2.1, and described in STD SUP 10.4-1, to include additional precautions to minimize the potential for steam and water hammer.

The revised STD SUP 10.4-1, in BLN COL FSAR Section 10.4.7.2.1 now reads as follows:

> *Operations and maintenance procedures include precautions, when appropriate, to minimize the potential for steam and water hammer, including:*
>
> - *Prevention of rapid valve motion.*
> - *Process for avoiding introduction of voids into water-filled lines and components.*
> - *Proper filling and venting of water-filled lines and components.*
> - *Process for avoiding introduction of steam or heated water that can flash into water-filled lines and components.*
> - *Cautions for introduction of water into steam-filled lines or components.*
> - *Proper warmup of steam-filled lines.*
> - *Proper drainage of steam-filled lines.*
> - *The effects of valve alignments on line conditions.*

Based on its review, the staff finds the applicant's response acceptable because a detailed list of the procedural precautions that would reduce or minimize the occurrence of water hammer was provided and included as a proposed revision to the COL application, Part 2, BLN COL FSAR Section 10.4.7.2.1. Further, the staff reviewed the precautions and compared them to the industry experience and staff guidance in accordance with Section 10.4.7 of NUREG-0800 and BTP 10-2. The staff finds that the applicant has adequately addressed the steam

and water hammer. Therefore, the staff's concern described in RAI 10.4.7-1 is resolved.

- *STD SUP 10.4-2*

The applicant provided supplemental information explaining that the EPRI PWR Secondary Water Chemistry Guidelines will be used for guidance on selection of pH control agents and pH optimization as described in NEI 97-06.

EPRI documents provide detailed guidelines for both qualification of the selected pH control chemicals and the optimization of the secondary pH. While the staff does not review or accept the EPRI PWR Secondary Water Chemistry Guidelines through a safety evaluation, these guidelines are recognized as representing the industry consensus on best practices in water chemistry control and have been proven to be effective via many years of successful operating experience. As such, the staff finds the application of the guidance of the EPRI PWR Secondary Water Chemistry Guidelines, and a programmatic commitment to use these guidelines, to be an acceptable method for the applicant to ensure compliance with GDC 14. As discussed in a Federal Register (FR) notice, dated March 2, 2005, 70 FR 10298, the reference to NEI 97-06 and the associated water chemistry guidelines provide reasonable assurance that SG tube integrity will be maintained.

10.4.7.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

10.4.7.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the condensate and feedwater system, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the requirements of GDC 4 and GDC 14 and the guidance in Sections 10.4.6, 10.4.7, and 5.4.2.1 of NUREG-0800, NUREG-0927, BTP 5-1, and BTP 10-2. The staff based its conclusions on the following:

- VCS COL 10.4-2 and STD SUP 10.4-2, relating to the condensate, feedwater, and auxiliary system chemistry control program, are in accordance with EPRI PWR Secondary Water Chemistry Guidelines, which is referenced in NUREG-0800 Sections 10.4.6 and 5.4.2.1, including BTP 5-1 of NUREG-0800. Meeting these guidelines ensures that GDC 14 is met with respect to integrity of the reactor coolant pressure boundary, specifically as the secondary water chemistry program ensures the integrity of the SG tubing.

- STD SUP 10.4-1, relating to operations and maintenance, is acceptable to the staff because the applicant has provided a detailed list of the procedural precautions that are consistent with Section 10.4.7 of NUREG-0800 and the BTP 10-2 acceptance criteria.

10.4.8 Steam Generator Blowdown System (Related to RG 1.206, Section C.III.1, Chapter 10, C.I.10.4.8, "Steam Generator Blowdown System (PWR)")

The SG blowdown system assists in maintaining acceptable secondary coolant water chemistry during normal operation and during anticipated operational occurrences, such as main condenser inleakage or primary to secondary SG tube leakage. It does this by processing water from each SG and removing impurities.

Section 10.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 10.4.8 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

10.4.9 Startup Feedwater System

The startup feedwater system provides a supply of feedwater to the SGs during plant startup, hot standby and shutdown conditions, and during transients in the event of main feedwater system unavailability. The startup feedwater system is composed of components from the AP1000 main and startup feedwater system and SG system.

Section 10.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 10.4.9 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

10.4.10 Auxiliary Steam System

The auxiliary steam system provides the steam required for plant use during startup, shutdown, and normal operation. Steam is supplied from either the auxiliary boiler or the main steam system.

Section 10.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 10.4.10 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

10.4.11 Turbine Island Chemical Feed

The turbine island chemical feed system injects required chemicals into the condensate, feedwater, auxiliary steam, service water, and demineralized water treatment. Chemical feed system components are located in the turbine building.

Section 10.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 10.4.11 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

10.4.12 Combined License Information

Section 10.4.12 of the VCSNS COL FSAR. Revision 5, incorporates by reference with no departures or supplements, Section 10.4.12, "Combined License Information," of Revision 19 of the AP1000 DCD. The NRC staff reviewed Section 10.4.12 of the VCSNS COL FSAR and checked the referenced DCD to ensure the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1]

The applicant addressed COL Information Items 10.4-1, 10.4-2, and 10.4-3. These items are discussed and evaluated in Sections 10.4.5, 10.4.7, and 9.2.5 of this SER, respectively.

11.0 RADIOACTIVE WASTE MANAGEMENT

The radioactive waste management systems are designed to control, collect, handle, process, store, and dispose of liquid, gaseous, and solid wastes that may contain radioactive materials. The systems include the instrumentation used to monitor and control the release of radioactive effluents and wastes and are designed for normal operation, including anticipated operational occurrences (e.g., refueling, purging, equipment downtime, maintenance).

11.1 Source Terms

The radioactive source terms are used to identify the potential dose to members of the public and plant employees as a result of plant operation. This includes consideration of parameters used to determine the concentration of each isotope in the reactor coolant, fraction of fission product activity released to the reactor coolant, and concentrations of all nonfission product radioactive isotopes in the reactor coolant. Gaseous and liquid waste sources are considered in the evaluation of effluent releases.

Section 11.1 of the V.C. Summer Nuclear Station (VCSNS) combined license (COL) Final Safety Analysis Report (FSAR), Revision 5, incorporates by reference, with no departures or supplements, Section 11.1, "Source Terms," of Revision 19 of the AP1000 Design Control Document (DCD). The Nuclear Regulatory Commission (NRC) staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[11] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," and its supplements.

11.2 Liquid Waste Management Systems

11.2.1 Introduction

The liquid waste management system (LWMS) is designed to control, collect, process, handle, store, and dispose of liquid radioactive waste generated as the result of normal operation, including anticipated operational occurrences.

11.2.2 Summary of Application

Section 11.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 11.2 of the AP1000 DCD, Revision 19.

[11] See Section 1.2.2 for a discussion of the staff's review related to verification of the scope of information to be included in a COL application that references a design certification (DC).

In addition, in VCSNS COL FSAR Section 11.2, the applicant provided the following:

AP1000 COL Information Items

- STD COL 11.2-1

The applicant provided additional information in Standard (STD) COL 11.2-1 to resolve COL Information Item 11.2-1 (COL Action Item 11.2-1). The additional information addresses the use of mobile or temporary equipment to process liquid effluents in VCSNS COL FSAR Section 11.2.1.2.5.2.

- STD COL 11.2-2

The applicant provided additional information in STD COL 11.2-2 regarding liquid radwaste cost-benefit analysis methodology.

- VCS COL 11.2-2

The applicant provided additional information in VCS COL 11.2-2 to resolve COL Information Item 11.2-2 (COL Action Item 11.2-2). The additional information addresses the dilution factors used for dose calculations and the cost-benefit analysis of population doses in VCSNS COL FSAR Sections 11.2.3.3 and 11.2.3.5.

- VCS COL 2.4-5 and VCS COL 15.7-1

VCSNS COL FSAR Section 11.2 does not identify VCS COL 2.4-5 and VCS COL 15.7-1 as COL information items applicable to Section 11.2. However, VCS COL 2.4-5 and VCS COL 15.7-1 provide information regarding a postulated liquid waste tank failure, which is evaluated by the NRC staff as part of liquid waste management. Therefore, VCS COL 2.4-5 and VCS COL 15.7-1 are evaluated in Section 11.2.4 of this safety evaluation report (SER). In VCSNS COL FSAR Section 2.4, the applicant performed the consequence analysis of a postulated liquid waste tank failure in FSAR Section 2.4.13 to address COL Information Items 2.4-5 and 15.7-1.

- VCS COL 11.5-3

The applicant provided additional information in VCS COL 11.5-3 to resolve COL Information Item 11.5-3 (COL Action Item 11.5-3). The additional information addresses compliance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic licensing of production and utilization facilities," Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents," Section II.A in VCSNS COL FSAR Section 11.2.3.5.

Supplemental Information

- STD SUP 11.2-1

The applicant added in VCSNS COL FSAR Section 11.2.3.6 supplemental (SUP) information to address the quality assurance (QA) program to be applied to the LWMS.

- VCS SUP 11.2-1

The applicant added supplemental information in VCSNS COL FSAR Section 11.2.1.2.4 regarding the exterior radwaste discharge piping. In a letter dated July 8, 2010, the applicant committed to add to a future version of the FSAR supplemental information in VCS SUP 11.2-1 that describes site-specific design features of the discharge piping.

11.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the regulatory basis for acceptance of the supplementary information on the LWMS is established in:

- 10 CFR 20.1301(e)
- 10 CFR 20.1302, "Compliance with dose limits for individual members of the public"
- 10 CFR 20.1406, "Minimization of contamination"
- 10 CFR 50.34a, "Design objectives for equipment to control release of radioactive material in effluents – nuclear power reactors"
- 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criteria (GDC) 60, "Control of Releases of Radioactive Materials to the Environment"
- 10 CFR Part 50, Appendix A, GDC 61, "Fuel Storage and Handling and Radioactivity Control"
- 10 CFR Part 50, Appendix I, Sections II.A and II.D
- 10 CFR 52.80(a)
- Title 40 of the *Code of Federal Regulations* (40 CFR) Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations"

Guidance for accepting the supplementary information on the LWMS is in:

- The codes and standards listed in Table 1 of Regulatory Guide (RG) 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants," Revision 2
- Regulatory Position C.1.1 of RG 1.143, Revision 2
- RG 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1

- RG 1.110, “Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors”

- RG 1.113, “Estimating Aquatic Dispersion of Effluents form Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I,” Revision 1

- RG 4.21, “Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning”

The acceptance criteria associated with the LWMS are given in Section 11.2 of NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition),” and NUREG-0800, Section 2.4.13, Acceptance Criterion No. 5, including Branch Technical Position (BTP) 11-6.

11.2.4 Technical Evaluation

The NRC staff reviewed Section 11.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff’s review confirmed that the information in the application and incorporated by reference addresses the required information relating to the LWMS. The results of the NRC staff’s evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff’s review of this application included the following COL information and supplementary items:

- STD COL 11.2-1, Processing of Liquid Waste by Mobile Equipment

- STD COL 11.2-2, Liquid Radwaste Cost-benefit Analysis Methodology

- VCS COL 11.2-2, Cost-benefit Analysis of Population Doses

- VCS COL 2.4-5, Accidental Release of Liquid Effluents into Groundwater and Surface Water

- VCS COL 15.7-1, Consequences of Tank Failure

- VCS COL 11.5-3, Individual Dose Limits in 10 CFR Part 50, Appendix I

- STD SUP 11.2-1, Quality Assurance

- VCS SUP 11.2-1, Exterior Radwaste Discharge Piping

In addition to the above items, the staff reviewed the entire section against Section 11.2 of NUREG-0800 to determine if the information in VCSNS COL FSAR Section 11.2 met the regulatory requirements in the regulations stated above (SER Section 11.2.3) and the NUREG-0800 acceptance criteria. The relevant NUREG-0800 acceptance criteria are as follows:

- The LWMS should have the capability to meet the dose design objectives and include provisions to treat liquid radioactive wastes such that the following is true:

    A. The calculated annual total quantity of all radioactive materials released from each reactor at the site to unrestricted areas will not result in an estimated annual dose or dose commitment from liquid effluents for any individual in an unrestricted area from all pathways of exposure in excess of 0.03 millisievert (mSv) (3 millirem [mrem]) to the total body or 0.1 mSv (10 mrem) to any organ. RGs 1.109, 1.112, and 1.113 provide acceptable methods for performing this analysis.

    B. In addition to A, the LWMS should include all items of reasonably demonstrated technology that, when added to the system sequentially and in order of diminishing cost-benefit return for a favorable cost-benefit ratio, can effect reductions in doses to the population reasonably expected to be within 80 kilometers (km) (50 miles [mi]) of the reactor. RG 1.110 provides an acceptable method for performing this analysis.

    C. The concentrations of radioactive materials in liquid effluents released to unrestricted areas should not exceed the concentration limits in Table 2, Column 2 of Appendix B, "Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage" to 10 CFR Part 20, "Standards for protection against radiation."

- The LWMS should be designed to meet the anticipated processing requirements of the plant. Adequate capacity should be provided to process liquid wastes during periods when major processing equipment may be down for maintenance (single failures) and during periods of excessive waste generation. Systems that have adequate capacity to process the anticipated wastes and that are capable of operating within the design objectives during normal operation, including anticipated operational occurrences, are acceptable. To meet these processing demands, interconnections between subsystems, redundant equipment, mobile equipment, and reserve storage capacity will be considered.

- System designs should describe features that will minimize, to the extent practicable, contamination of the facility and environment; facilitate eventual decommissioning; and minimize, to the extent practicable, the generation of radioactive waste, in accordance with the guidelines of RG 1.143, for liquids and liquid wastes produced during normal operation and anticipated operational occurrences, and the requirements of 10 CFR 20.1406. These system design features should be provided in the FSAR or the COL application to the extent that they are not addressed in a referenced certified design or DC application.

- BTP 11-6, as it relates to the assessment of a potential release of radioactive liquids following the postulated failure of a tank and its components, located outside of containment, and impacts of the release of radioactive materials at the nearest potable water supply, located in an unrestricted area, for direct human consumption or indirectly through animals, crops, and food processing.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (Vogtle Electric Generating Plant [VEGP] Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs).

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 11.2.4 of the VEGP SER:

AP1000 COL Information Items

The following portion of this technical evaluation section is reproduced from Section 11.2.4 of the BLN SER:

- *STD COL 11.2-1*

The applicant provided additional information in STD COL 11.2-1 to resolve COL Information Item 11.2-1. COL Information Item 11.2-1 states:

> *The Combined License applicant will discuss how any mobile or temporary equipment used for storing or processing liquid radwaste conforms to Regulatory Guide 1.143. For example, this includes discussion of equipment containing radioactive liquid radwaste in the non-seismic Radwaste Building.*

The commitment was also captured in COL Action Item 11.2-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will provide information on how any mobile or temporary equipment used for storing or processing liquid radwaste conforms to RG 1.143.*

The applicant provided information in BLN COL FSAR Section 11.2.1.2.5.2 that addresses how any mobile or temporary equipment that will be used for storing or processing liquid radwaste conforms to RG 1.143. For example, this includes discussion of equipment containing radioactive liquid radwaste in the non-seismic Radwaste Building. The staff issued Request for Additional Information (RAI) 11.2-5 to clarify some of the language used in the COL concerning the extent of compliance with RG 1.143 for the temporary and mobile equipment. The applicant responded to this RAI by proposing a revision to the BLN COL FSAR text to clearly state that the applicable requirements in RG 1.143 pertain to mobile and temporary equipment.

The NRC staff reviewed the resolution of COL Information Item 11.2-1 related to the use of mobile or temporary equipment included under Section 11.2 of the BLN COL FSAR and found that the applicant's commitments for installing and operating mobile systems meets the acceptance criteria in Section 11.2 of NUREG-0800 and RG 1.143. The NRC staff verified that Revision 1 of the BLN COL FSAR (STD COL 11.2-1) adequately incorporates the above. As a result, RAI 11.2-5 is closed.

- *STD COL 11.2-2*

The discussion of VEGP COL 11.2-2 addresses the site-specific cost-benefit analysis performed to address the requirements of 10 CFR Part 50, Appendix I, regarding population doses due to liquid effluents. The applicant provided additional information in STD COL 11.2-2 to resolve COL Information Item 11.2-2 with regard to the cost-benefit analysis methodology.

The NRC staff reviewed the resolution of COL Information Item 11.2-2 related to the cost-benefit analysis methodology described in VEGP FSAR Section 11.2.3.5.1 and concluded that the methodology used for the analysis was consistent with the guidance of RG 1.110 and was, therefore, acceptable.

- VCS COL 11.2-2

The applicant provided additional information in VCS COL 11.2-2 to resolve COL Information Item 11.2-2, which states:

> The analysis performed to determine offsite dose due to liquid effluents is based upon the AP1000 generic site parameters included in Chapter 1 and Tables 11.2-5 and 11.2-6. The Combined License [COL] applicant will provide a site specific cost-benefit analysis to address the requirements of 10 CFR 50, Appendix I, regarding population doses due to liquid effluents.

The commitment was also captured as COL Action Item 11.2-2 in Appendix F of NUREG-1793, which states:

> The applicant will provide a site-specific cost-benefit analysis to demonstrate compliance with 10 CFR Part 50, Appendix I, regarding population doses due to liquid effluents.

The NRC staff reviewed the resolution of COL Information Item 11.2-2 related to the cost benefit analysis included under Section 11.2.3.5.2 of the VCSNS COL FSAR and issued RAI 11.2-1. This RAI stated that the applicant needed to provide a detailed and plant-specific cost-benefit analysis. The applicant provided this analysis in a response to the RAI.

The results of the applicant's analysis showed that the lowest-cost option for liquid radwaste treatment system augments is a 20 gallons per minute (gpm) cartridge filter at $11,140 per year. Assuming that this filter will eliminate all radioactivity from the liquid effluent, the resulting cost per dose reduction was $763 per total body person-rem and $1,714 per thyroid person-rem. The cost per person-rem total body does not exceed the $1,000 per person-rem criteria provided in RG 1.110, and, therefore, required additional evaluation. Of the 14.6 person-rem total body dose, 4.6 person-rem is due to tritium, which will not be mitigated by the 20 gpm cartridge filter. Assuming that the augment completely eliminates the dose of 10 person-rem total body due to isotopes other than tritium, the cost of the total body dose reduction is $11,140/10 person-rem total body or $1,114 per person-rem total body. This is above the cost criterion of $1,000 per person-rem for an augment in 10 CFR Part 50, Appendix I, Section II.D. Thus, the applicant concluded that the LWMS meets the as low as reasonably achievable (ALARA) requirements and requires no augments.

The NRC staff performed an independent assessment using the population doses calculated by the staff (see following section) and the guidance in RG 1.110 and came to the same conclusion. As a result, RAI 11.2-1 is closed.

- VCS COL 2.4-5 and VCS COL 15.7-1

The applicant provided additional information in VCS COL 2.4-5 and VCS COL 15.7-1 to resolve COL Information Items 2.4-5 and 15.7-1.

COL Information Item 2.4-5 states:

> Combined License applicants referencing the AP1000 certified design will address site-specific information on the ability of the ground and surface water to disperse, dilute, or concentrate accidental releases of liquid effluents. Effects of these releases on existing and known future use of surface water resources will also be addressed.

The commitment was also captured as COL Action Item 2.4.1-1 in Appendix F of NUREG-1793, which states:

> The COL applicant will provide site specific information on the ability of the ground and surface water to disperse, dilute, or concentrate accidental releases of liquid effluents. The COL applicant will also address the effects of such releases on existing and known future use of surface water resources.

COL Information Item 15.7-1 states:

> Combined License applicant referencing the AP1000 certified design will perform an analysis of the consequences of potential release of radioactivity to the environment due to a liquid tank failure as outlined in subsection 15.7.3.

The commitment was also captured as COL Action Item 15.3.8-1 in Appendix F of NUREG-1793, which states:

> The COL applicant will perform a site-specific analysis of the consequences of a potential release of radioactivity to the environment as a result of a liquid tank failure.

Section 2.4.13 of the applicant's FSAR addresses accidental release of liquid effluents into ground and surface water. The applicant postulated a release of the contents of the waste liquid system effluent hold-up tank. BTP 11-6 provides guidance in assessing potential release of radioactive liquids at the nearest potable water supply located in an unrestricted area. BTP 11-6 states the evaluation of the release should consider the use of water for direct human consumption or indirectly through animals (livestock watering), crops (agricultural irrigation), and food processing (water as an ingredient).

Evaluations performed by Westinghouse determined that the waste effluent hold-up tanks have the greatest potential radionuclide inventory of all waste effluent system tanks. The failed tank is assumed to have nuclide maximum concentrations corresponding to 101 percent of the reactor coolant source term. The entire contents of the tank are assumed to be released to the groundwater (unconfined aquifer) instantaneously. This assumption is very conservative because it requires failure of the floor drain system and it ignores the barriers presented in the basemat and exterior walls of the auxiliary building. The release migrates in the direction of decreasing hydraulic head either toward an unnamed creek north-northwest of Unit 2 or toward an unnamed creek south-southwest of Unit 3.

Flow from the release point to the creeks would be primarily through the saprolite material. Radionuclide concentrations of the liquid released would be reduced by the process of adsorption, hydrodynamic dispersion and radioactive decay. Upon reaching the two unnamed creeks, radionuclides would mix with the uncontaminated surface water in the creeks and eventually discharge into the Broad River, leading to further reduction of concentrations. In Section 2.4.13.1.2.4 of the VCSNS COL FSAR, the applicant calculated the concentrations of radionuclides taking into consideration radioactive decay, adsorption and dilution at Parr Shoals Dam, which is the nearest potable water supply. The results of the calculations are listed in FSAR Table 2.4-234. The concentrations in the table are those that represent more than 1 percent of their respective maximum permissible concentrations.

In RAI 2.4.13-1, the staff requested that the applicant address other pathways such as fish and crop irrigation. In a letter dated February 18, 2009, the applicant stated that of the three isotopes that are present following transport through groundwater and decay, tritium is the most significant, with a concentration of 5.1 E-7 microCi/ml for Unit 2. The applicant estimated the dose for tritium by comparing the tritium concentration to the concentrations in routine liquid effluent discharges for which doses have been calculated.

The results of the calculation of liquid effluent doses from normal releases are described in VCSNS COL FSAR Section 11.2. In response to RAI 11.2-3, the applicant provided the

breakdown of dose by pathway from normal liquid effluent releases. Table 11.2-1 of this SER provides these dose estimates.

These doses are based on the normal isotopic release shown in AP1000 DCD Table 11.2-7, including 1,010 Ci/yr for tritium. The tritium concentration in the Broad River due to routine effluents is 2.4E-7 microCi/ml.

Whether the activity released is due to routine effluents or due to a tank failure, the assumptions at the receptor would be the same in both scenarios. If it is assumed that the doses in Table 11.2-1 of this SER are entirely due to tritium, the dose from the liquid radwaste tank failure may be estimated by multiplying the doses in Table 11.2-1 by the ratio of 5.2E-7 microCi/ml to 2.4E-7 microCi/ml, essentially doubling the dose in the table, or about 1.1E-1 mrem/event. This is a conservative assumption because some of the dose from normal effluents is from radionuclides other than tritium.

The effluent concentration limits in 10 CFR Part 20, Appendix B, Table 12, Column 2 correspond to an annual dose of 50 mrem. Compared to this limit, the above dose is negligible. Based on the above evaluation and the applicant's analysis in its response to RAI 2.4.13-1, the staff finds potential doses to members of the public resulting from an accidental release of liquid effluents meet Acceptance Criterion 5 in NUREG-0800 and the referenced BTP 11-6.

- VCS COL 11.5-3

The applicant provided additional information in VCS COL 11.5-3 to resolve the COL applicant's responsibilities as set forth in Section 11.5.7 of the AP1000 DCD, which states:

> The COL applicant is responsible for addressing the 10 CFR Part 50, Appendix I, Sections II.A and II.D guidelines for maximally exposed offsite individual doses and population doses via liquid and gaseous effluents.

The commitment was also captured as COL Action Item 11.5-3 in Appendix F of NUREG-1793, which states:

> The COL applicant is responsible for addressing the guidelines of Appendix I to 10 CFR Part 50, as they relate to maximally exposed offsite individual doses and population doses attributable to liquid and gaseous effluents.

In VCSNS COL FSAR Section 11.2.3.5, the applicant discussed the methods used to assure that individual and estimated population doses are maintained ALARA in accordance with 10 CFR Part 50, Appendix I (this information is also applicable to FSAR Sections 11.3.3.4 and 11.4).

The NRC staff reviewed the applicant's response to VCS COL 11.5-3 related to compliance with 10 CFR Part 50, Appendix I, Sections II.A and II.D and issued RAI 11.2-3. RAI 11.2-3 requested the applicant to provide the details of the individual and population dose analysis.

In response to RAI 11.2-3, the applicant provided a description of the required model assumptions and input parameters needed to run LADTAP II computer codes to calculate radionuclide concentrations in the Broad River. The applicant also revised its LADTAP analysis to include commercial fishing.

Using radiological exposure models based on RG 1.109 and the LADTAP II computer program (NUREG/CR-4013, "LADTAP II - Technical Reference and User Guide," April 1986), the applicant calculated the estimated doses to a hypothetical maximally exposed individual (MEI) of the public and to the population within 80 km (50 mi) from the postulated liquid effluents discharged.

VCSNS COL FSAR Tables 11.2-201 and 11.2-202 include liquid pathway parameters used as input to the dose calculation, including discharge flow rate, site-specific dilution factors, transit-times to receptors, consumption factors for fish and water, and recreational usage data for the Broad River. Because discharge is directly to the Broad River, including Parr Reservoir, the applicant's analysis did not consider any impoundment reconcentration model to calculate dilution of the radioactive effluent by the Broad River. As a result, no dilution was credited beyond that provided by the Broad River. FSAR Tables 11.2-203 and 11.2-204 list the liquid pathway doses to the MEI and surrounding population, respectively.

The applicant calculated a maximum individual annual dose to the adult total body of 0.0014 mSv (0.14 mrem) and a maximum annual individual organ dose to the adult GI-LLI of 0.005 mSv (0.5 mrem), both from all pathways. The applicant compared the MEI doses with the 10 CFR Part 50, Appendix I, Section II.A criteria and showed the doses to be well below the limits of 3 mrem to the total body and 10 mrem to any organ.

The calculated annual population doses listed in VCSNS COL FSAR Table 11.2-204 are 0.146 person-Sv (14.6 person-rem) to the total body and 0.0653 person-Sv (6.53 person-rem) to the thyroid. The applicant used the population doses in the cost-benefit analysis previously described in this SER.

In response to RAI 11.2-3, the applicant explained the derivation of values used for population water use, sport fish harvest, commercial fish harvest, and recreational time spent on the river. The staff reviewed the derivation of these values and found them to be reasonable upper bound estimates. Consequently, the staff used the applicant's values in its independent dose estimation.

The NRC staff performed an independent assessment using the LADTAP II computer code and compared results to the applicant's and the Appendix I criteria. The modeling assumptions used by the staff for the MEI and population dose calculations, as shown in Table 11.2-2 of this SER, were consistent with the applicant's. Modeling parameter values, as shown in Table 11.2-3 of this SER, were also consistent with the applicant's. The results of the staff's calculations were consistent with those of the applicant.

SER Table 11.2-4 compares the resulting dose estimates between the applicant's analysis and the 10 CFR Part 50, Appendix I criteria. This table shows that all doses are below the Appendix I criteria. The staff concludes that the applicant has provided a bounding assessment demonstrating its capability to comply with the regulatory requirements in 10 CFR Part 20 and 10 CFR Part 50, Appendix I.

The following portion of this technical evaluation section is reproduced from Section 11.2.4 of the VEGP SER:

> *Supplemental Information*
>
> *The following portion of this technical evaluation section is reproduced from Section 11.2.4 of the BLN SER:*
>
> - *STD SUP 11.2-1*
>
> *The applicant provided supplemental information in BLN COL FSAR Section 11.2.3.6, "Quality Assurance," addressing the quality assurance program to be applied to the liquid waste system and stated that the program complies with the guidance presented in RG 1.143.*
>
> *The NRC staff reviewed this supplemental quality assurance information included in BLN COL FSAR Section 11.2.3.6 and finds that this supplemental statement commits the applicant to the regulatory positions in RG 1.143 related to quality assurance and is acceptable.*

- VCS SUP 11.2-1

The applicant provided supplemental information in VCS SUP 11.2-1 related to the exterior radwaste discharge piping. The information was provided in a July 8, 2010, letter that committed to include the supplemental information in Section 11.2.1.2.4 of a future version of the VCSNS COL FSAR. The information stated that the section of piping between the liquid radwaste system and the junction of the pipe with the wastewater system blowdown line would be stainless steel, enclosed within a guard pipe, and monitored for leakage. Between the piping junction and the plant outfall at Parr Reservoir, the discharge would be diluted to meet the release limits of 10 CFR Part 20, Appendix B, Table II, Column 2, primarily with flow from circulating water blowdown. This section of piping would be buried, high density polyethylene single-walled pipe, would have no valves, vacuum breakers, or pumps, and would be gravity drained. The applicant stated that leakage monitoring would be determined as part of the groundwater monitoring program established in accordance with Nuclear Energy Institute (NEI) 08-08A, "Generic FSAR Template Guidance for Life Cycle Minimization of Contamination."

This item is related to 10 CFR 20.1406 and is addressed in FSER Section 12.3.

Demonstrating Compliance with 10 CFR 20.1301(e)

10 CFR 20.1301(e) requires that NRC-licensed facilities comply with the Environmental Protection Agency (EPA) generally applicable environmental radiation standards of 40 CFR Part 190 for facilities that are part of the fuel cycle. The EPA annual dose limits are 0.25 mSv (25 mrem) to the whole body, 0.75 mSv (75 mrem) to the thyroid, and 0.25 mSv (25 mrem) to any other organ. Meeting the requirements of 10 CFR 20.1301(e) requires the consideration of all potential sources of external radiation and radioactivity, including liquid and gaseous effluents and external radiation exposures from buildings, storage tanks, radioactive waste storage areas, and N-16 skyshine from boiling-water reactor (BWR) turbine buildings. The EPA standards apply to the entire site or facility, whether it has a single unit or multiple units.

The staff's review of the VCSNS COL FSAR revealed that the applicant did not provide any information demonstrating compliance with 10 CFR 20.1301(e). Because of this, the staff issued RAI 11.2-2 requesting that the applicant demonstrate compliance with the EPA standard.

The applicant provided the demonstration by summing the annual individual liquid and gaseous effluent doses for the new Units 2 and 3 with those for the existing Unit 1. In response to RAI 11.3-3, the applicant listed the results in the draft revised FSAR Table 11.3-206. Table 11.2-5 in this SER lists these dose summations and compares them to the dose requirements in 40 CFR Part 190. The expected doses are below the EPA limits, and VCSNS COL FSAR Table 11.3-206 has been revised to include the results given in the RAI response.

Demonstrating Compliance with 10 CFR 20.1302

The annual average concentration of radioactive material released in liquid effluents at the boundary of the unrestricted area must not exceed the values specified in Table 2 of Appendix B to 10 CFR Part 20. The applicant demonstrated compliance with this requirement by referencing the AP1000 DCD. Section 11.2.3.4 of the DCD shows that even at the Technical Specification limit for percent failed fuel defects, the nominal blowdown flow provides sufficient dilution to ensure that the expected effluent release concentrations would be less than those specified in Table 2 of Appendix B to 10 CFR Part 20.

In NUREG-1793, the staff evaluated and accepted the conclusions of Section 11.2.3.4 of the AP1000 DCD. Based on this acceptance, the staff concludes that the applicant complies with 10 CFR 20.1302.

Demonstrating Compliance with 10 CFR 20.1406

10 CFR 20.1406 requires the applicant to provide a description of how facility design and procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment; facilitate eventual decommissioning; and minimize, to the extent practicable, the generation of radioactive waste. The applicant demonstrated compliance with this requirement by incorporating by reference the design descriptions provided in the AP1000 DCD and providing the description of operating programs in VCSNS COL FSAR Sections 12.3 and 12.5. The staff's evaluation and conclusion pertaining to compliance with 10 CFR 20.1406 are included in SER Section 12.3.

11.2.5 Post Combined License Activities

There are no post-COL activities related to this section.

11.2.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the LWMS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff evaluated the additional COL information (STD COL 11.2-1, STD COL 11.2-2, VCS COL 2.4-5, VCS COL 15.7-1, VCS COL 11.2-2, VCS COL 11.5-3, STD SUP 11.2-1, and VCS SUP 11.2-1) in the application against the relevant NRC regulations, acceptance criteria defined in NUREG-0800, Section 11.2, and other NRC regulatory guides. The applicant has satisfactorily addressed all RAIs related to Section 11.2.

The staff verified that the applicant had provided sufficient information and that the review and calculations support the conclusions that follow. The staff concludes that the LWMS (as a permanently installed system or in combination with mobile systems) includes the equipment necessary to control releases of radioactive materials in liquid effluents in accordance with GDC 60 and 61 of Appendix A to 10 CFR Part 50 and the requirements of 10 CFR 50.34a. The staff concludes that the design of the LWMS is acceptable and meets the requirements of 10 CFR 20.1301(e), 10 CFR 20.1302, 10 CFR 20.1406, 10 CFR 50.34a, GDC 60 and 61, and Appendix I to 10 CFR Part 50.

11.3 Gaseous Waste Management System

11.3.1 Introduction

The gaseous waste management system (GWMS) is designed to control, collect, process, handle, store, and dispose of gaseous radioactive waste generated as the result of normal operation, including anticipated operational occurrences.

11.3.2 Summary of Application

Section 11.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 11.3 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 11.3, the applicant provided the following:

AP1000 COL Information Items

- STD COL 11.3-1

The applicant provided additional information in STD COL 11.3-1 to resolve COL Information Item 11.3-1 (COL Action Item 11.3-1) regarding gaseous radwaste cost-benefit analysis methodology.

- VCS COL 11.3-1

The applicant provided additional information in VCS COL 11.3-1 to resolve COL Information Item 11.3-1 (COL Action Item 11.3-1). The additional information addresses the estimated doses to the public from the gaseous waste system and the associated cost-benefit analysis in VCSNS COL FSAR Section 11.3.3.4.

- VCS COL 11.5-3

The applicant provided additional information in VCS COL 11.5-3 to resolve COL Information Item 11.5-3 (COL Action Item 11.5-3). The additional information addresses compliance with 10 CFR Part 50, Appendix I, Sections II.B and II.C related to operation of the gaseous waste system in VCSNS COL FSAR Section 11.3.3.4.

Supplemental Information

- STD SUP 11.3-1

The applicant added supplemental information in VCSNS COL FSAR Section 11.3.3.6 to address the QA program to be applied to the GWMS.

- STD SUP 11.3-2

The applicant added supplemental information in VCSNS COL FSAR Section 11.3.3 to address the gaseous effluent site interface parameter.

11.3.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the regulatory basis for acceptance of the supplementary information on the GWMS is established in:

- 10 CFR 20.1301(e)
- 10 CFR 20.1302
- 10 CFR 20.1406
- 10 CFR 50.34a
- 10 CFR Part 50, Appendix A, GDC 3, “Fire Protection”
- 10 CFR Part 50, Appendix A, GDC 60
- 10 CFR Part 50, Appendix A, GDC 61
- 10 CFR Part 50, Appendix I, Sections II.B, II.C, and II.D
- 10 CFR 52.80(a)

Guidance for meeting these requirements is in:

- Regulatory Position C.2 of RG 1.143, Revision 2
- RG 1.109, Revision 1

- RG 1.110

- RG 1.111, “Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Nuclear Power Reactors,” Revision 1

- RG 4.21

The acceptance criteria associated with the GWMS are given in Section 11.3 of NUREG-0800, including BTP 11-5.

11.3.4 Technical Evaluation

The NRC staff reviewed Section 11.3 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff’s review confirmed that the information in the application and incorporated by reference addresses the required information relating to the GWMS. The results of the NRC staff’s evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff’s review of this application included the following COL information and supplementary items:

- STD COL 11.3-1, Gaseous Radwaste Cost-Benefit Analysis Methodology

- VCS COL 11.3-1, Cost-Benefit Analysis of Population Doses

- VCS COL 11.5-3, 10 CFR Part 50, Appendix I, Sections II.B and II.C

- STD SUP 11.3-1, Supplemental Information on Quality Assurance

- STD SUP 11.3-2, Supplemental Information on Gaseous Effluent Site Interface Parameters

In addition to the above items, the staff reviewed the entire section against Section 11.3 of NUREG-0800 to determine if the information in VCSNS COL FSAR Section 11.3 met the regulatory requirements in the regulations stated above (SER Section 11.3.3) and NUREG-0800 acceptance criteria. The relevant NUREG-0800 acceptance criteria are as follows:

- The GWMS should have the capability to meet the dose design objectives and should include provisions to treat gaseous radioactive wastes, such that the following is true:

    A. The calculated annual total quantity of all radioactive materials released from each reactor to the atmosphere will not result in an estimated annual external dose from gaseous effluents to any individual in unrestricted areas in excess of 0.05 mSv (5 mrem) to the total body or 0.15 mSv (15 mrem) to the skin. RGs 1.109 and 1.111 provide acceptable methods for performing this analysis.

B. The calculated annual total quantity of radioactive materials released from each reactor to the atmosphere will not result in an estimated annual air dose from gaseous effluents at any location near ground level, which could be occupied by individuals in unrestricted areas in excess of 0.01 centiGray (cGy) (10 millirads) for gamma radiation or 0.02 cGy (20 millirads) for beta radiation. RGs 1.109 and 1.111 provide acceptable methods for performing this analysis.

C. The calculated annual total quantity of radioiodines, carbon-14, tritium, and all radioactive materials in particulate form released from each reactor at the site in effluents to the atmosphere will not result in an estimated annual dose or dose commitment from such releases for any individual in an unrestricted area from all pathways of exposure in excess of 0.15 mSv (15 mrem) to any organ. RGs 1.109 and 1.111 provide acceptable methods for performing this analysis.

D. In addition to 1.A, 1.B, and 1.C, above, the GWMS should include all items of reasonably demonstrated technology that, when added to the system sequentially and in order of diminishing cost-benefit return, for a favorable cost-benefit ratio, can effect reductions in dose to the population reasonably expected to be within 80 km (50 mi) of the reactor. RG 1.110 provides an acceptable method for performing this analysis.

E. The concentrations of radioactive materials in gaseous effluents released to an unrestricted area should not exceed the limits specified in Table 2, Column 1, of Appendix B to 10 CFR Part 20.

F. The regulatory position in RG 1.143 is met, as it relates to the definition of the boundary of the GWMS, beginning at the interface from plant systems to the point of controlled discharges to the environment as defined in the Offsite Dose Calculation Manual (ODCM), or at the point of storage in holdup tanks or decay beds for gaseous wastes produced during normal operation and anticipated operational occurrences.

- System designs should describe features that will minimize, to the extent practicable, contamination of the facility and environment; facilitate eventual decommissioning; and minimize, to the extent practicable, the generation of radioactive waste in accordance with RG 1.143, for gaseous wastes produced during normal operation and anticipated operational occurrences, and the requirements of 10 CFR 20.1406 or the DC application, update in the SAR, or the COL application to the extent not addressed in a referenced certified design.

- BTP 11-5, as it relates to potential releases of radioactive materials (noble gases) as a result of postulated leakage or failure of a waste gas storage tank or offgas charcoal delay bed.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application. Any confirmatory items in the standard content material retain the numbers assigned in the VEGP SER. Confirmatory items that are first identified in this SER section have a VCSNS designation (e.g., **VCSNS Confirmatory Item 11.3-1**).

AP1000 COL Information Items

The following portion of this technical evaluation section is reproduced from Section 11.3.4 of the VEGP SER:

- *STD COL 11.3-1*

The discussion of VEGP COL 11.3-1 addresses the site-specific cost-benefit analysis performed to address the requirements of 10 CFR Part 50, Appendix I, regarding population doses due to gaseous effluents. The applicant provided additional information in STD COL 11.3-1 to resolve COL Information Item 11.3-1 with regard to the cost-benefit analysis methodology.

The NRC staff reviewed the resolution of COL Information Item 11.3-1 related to the cost-benefit analysis methodology described in VEGP COL FSAR Section 11.3.3.4 and concluded that the methodology used for the analysis was consistent with the guidance of RG 1.110 and was, therefore, acceptable.

- VCS COL 11.3-1

The applicant provided additional information in VCS COL 11.3-1 to resolve COL Information Item 11.3-1, which states:

> The analysis performed to determine offsite dose due to gaseous effluents is based upon the AP1000 generic site parameters included in Chapter 1 and

> Tables 11.3-1, 11.3-2 and 11.3-4. The Combined License applicant will provide a site specific cost-benefit analysis to demonstrate compliance with 10 CFR 50, Appendix I, regarding population doses due to gaseous effluents.

The commitment was also captured as COL Action Item 11.5-3 in Appendix F of NUREG-1793, which states:

> The COL applicant will provide a site-specific cost-benefit analysis to demonstrate compliance with 10 CFR 50, Appendix I, regarding population doses due to gaseous effluents.

The NRC staff reviewed the resolution of COL Information Item 11.3-1 related to the cost-benefit analysis included under Sections 11.3.3.4.2 and 11.3.5.1 of the VCSNS COL FSAR and issued RAI 11.3-1 because the NEI Template 07-11, "Generic FSAR Template Guidance for Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors," cited by South Carolina Electric and Gas (SCE&G) had been withdrawn by NEI from further consideration. This RAI asked the applicant to provide a detailed and plant-specific cost-benefit analysis.

In response to RAI 11.3-1, the applicant performed a site-specific analysis to determine whether the offsite dose due to gaseous effluents is bounded by the AP1000 site parameters included in Chapter 1 and Tables 11.3-1, 11.3-2 and 11.3-4 of the DCD. The applicant discussed the site-specific cost-benefit analysis in VCSNS COL FSAR Section 11.3.3.4 to address the requirements of 10 CFR Part 50, Appendix I, Section II.D, regarding population doses due to gaseous effluents. The dose and dose rate to man was calculated using the GASPAR II computer code, which is based on the methodology presented in RG 1.109.

The applicant's analysis showed that the lowest-cost option for gaseous radwaste treatment system augments is the steam generator flash tank vent to main condenser at $6,320 per year. The population doses, 2.7 person-rem total body per reactor and 6.4 person-rem thyroid per reactor, are given in the VCSNS COL FSAR Table 11.3-205. Assuming that this augment will eliminate all radioactivity from the gaseous effluent, the resulting cost per dose reduction was $2,340 per total body person-rem ($6,320/2.7) and $988 per thyroid person-rem ($6,320/6.4). While the costs per person-rem reduction exceed the $1,000 per person-rem criterion considering the total body dose, the costs considering the thyroid dose are below the $1,000 per person-rem and, therefore, warranted further evaluation.

Since the estimated thyroid dose of 6.4 person-rem exceeds the 6.32 person-rem threshold value ($6,320 augment at $1,000 per person-rem), those system augments listed in RG 1.110 with a total annual cost of less than $6,700 were evaluated to determine if they would be cost beneficial. The only such augment is the one already mentioned above. Addition of this augment presumes that the design already includes a steam generator flash tank. The AP1000 design does not include a steam generator flash tank, but instead uses steam generator piping blowdown heat exchangers that provide cooling of the blowdown fluid and prevent flashing prior to blowdown entering the main condenser. Adding the installation of a flash tank to this augment is estimated to cause the estimated total annual cost to increase significantly and would result in the conclusion that this augment is not cost beneficial.

The applicant went on to state that even if a vent line similar to the one described as the above system augment is considered, it would not mitigate the thyroid dose contribution from noble gases. Of the 6.4 person-rem thyroid dose stated above, 1.2 person-rem is due to noble gases.

Even assuming that this system augment completely eliminates the dose of 5.2 person-rem thyroid due to isotopes other then noble gases, the cost of the thyroid dose reduction would be $6,320/5.2 person-rem thyroid, or $1,215 per person-rem thyroid. This cost exceeds the $1,000 per person-rem criterion described in Appendix I to 10 CFR Part 50; therefore, the system augment is not cost beneficial.

The staff reviewed this evaluation and concurred with its results. The augment considered is already the lowest cost augment available. This is above the cost criterion of $1,000 per person-rem for an augment in 10 CFR Part 50, Appendix I, Section II.D. Thus, the staff concluded that the GWMS meets ALARA requirements and requires no augments.

- VCS COL 11.5-3

The applicant provided additional information in VCS COL 11.5-3 to resolve COL Information Item 11.5-3, which states:

> The Combined License applicant is responsible for addressing the 10 CFR 50, Appendix I guidelines for maximally exposed offsite individual doses and population doses via liquid and gaseous effluents.

The commitment was also captured as COL Action Item 11.5-3 in Appendix F of NUREG-1793, which states:

> The COL applicant is responsible for addressing the guidelines of Appendix I to 10 CFR Part 50, as they relate to maximally exposed offsite individual doses and population doses attributable to liquid and gaseous effluents.

The NRC staff reviewed the resolution of COL Information Item 11.5-3 related to the compliance with Appendix I to 10 CFR Part 50 as presented in Section 11.3.3.4 of the VCSNS COL and issued RAI 11.3-2 requesting the applicant provide the details of the individual and population dose analysis.

The response to RAI 11.3-2 showed that the applicant evaluated the impacts from gaseous effluent releases by considering the probable pathways to individuals and populations near the proposed new units. The applicant estimated the total-body and organ dose to the MEI from the gaseous effluent release pathways, and also calculated a collective total body and organ dose for the population within 80 km (50 mi) of the VCSNS site. The estimates of the maximum doses to the public are based on the AP1000 reactor's normal operational effluent releases as discussed in the AP1000 DCD. The applicant evaluated the impact of these doses by comparing them to applicable regulatory limits.

If built, the postulated two new units at the VCSNS site would release gaseous effluents into the atmosphere. The applicant calculated doses for several airborne pathways, including direct exposure to a radioactive plume, direct exposure to radioactivity deposited on the ground, inhalation of airborne radioactivity, and ingestion of contaminated agricultural products including vegetables, milk, and meat. The applicant assumed that the MEI consumes both cow and goat's milk, while the population consumes only cow's milk.

In response to RAI 11.3-2, the applicant provided a description of all required model assumptions and input parameters needed to run the GASPAR II computer code. Using radiological exposure models based on RG 1.109, Revision 1, and the GASPAR II computer

program (NUREG/CR-4653, “GASPAR II - Technical Reference and User Guide,” March 1987), the applicant calculated the estimated doses to a hypothetical MEI of the public and to the population within 80 km (50 mi) from the postulated gaseous effluents discharged.

The applicant maximized the estimated MEI doses by choosing conservative locations and dispersion data for the calculations. Since the application was originally submitted, the dispersion factors have been revised slightly to reflect meteorological data collected at the new tower for Units 2 and 3 in 2007. Based on the new meteorological data, the atmospheric dispersion and ground deposition factors have been revised. Although the meat animal, milk animal, and vegetable garden actually have equal or lower dispersion values, the residence location values were used for all four receptors.

VCSNS COL FSAR Tables 11.3-201 and 11.3-202 include gaseous pathway parameters used as input to the dose calculation, including population data and site-specific agricultural usage information. The applicant provided detailed justifications for these parameter values in the response to RAI 11.3-2. FSAR Tables 11.3-203 and 11.2-205 list the gaseous pathway doses to the MEI and surrounding population, respectively.

The applicant calculated the gaseous pathway doses to the MEI. The results (VCSNS COL FSAR Table 11.3-204) show for conservative locations a gamma annual air dose of 0.0071 milliGray (mGy) or 0.71 millirad (mrad), a beta annual air dose of 0.030 mGy or 3.0 mrads; a total annual body dose of 0.0058 mSv or 0.58 mrem and an annual skin dose of 0.024 mSv or 2.4 mrem.

The calculated annual population doses listed in VCSNS COL FSAR Table 11.3-205 are 0.027 person-SV (2.7 person-rem) to the total body and 0.064 person-SV (6.4 person-rem) to the thyroid. The applicant used the population doses in the cost-benefit analysis described in the VCSNS COL FSAR and evaluated in this SER.

The NRC staff performed an independent assessment using the GASPAR II computer code and compared its results to the applicant’s and the Appendix I criteria. The modeling assumptions used and parameter values used were consistent with the applicant’s.

In response to RAI 11.3-2, the applicant explained the derivation of values used for agricultural and usage parameters including the total production of vegetables, milk, and meat in the 80 km area around the site. The staff evaluated and verified the derivation of these values and found them to be reasonable upper bound estimates. Consequently, the staff used the applicant’s agricultural and usage values listed in VCSNS COL FSAR Table 11.3-201 for the dose estimation.

The staff evaluated and agreed with the approach taken by the applicant to calculate maximum annual individual doses from gaseous effluents. Using this same approach, the staff verified the individual doses in the VCSNS COL FSAR by independently running the GASPAR II computer code with the applicant’s parameter values. Table 11.3-1 in this SER compares the resulting dose estimates from the applicant’s analyses with the 10 CFR Part 50, Appendix I criteria. All doses are well below the Appendix I, Sections II.B and II.C criteria.

The staff evaluated and agreed with the approach taken by the applicant to calculate population doses from gaseous effluents. Using this same approach, the staff verified the population doses in the VCSNS COL FSAR by independently running the GASPAR II computer code with the applicant’s parameter values. The applicant then used these doses in a cost-benefit

analysis for augments to the GWMS. Table 11.3-2 in this SER summarizes the results of the applicant's and staff's analysis of population doses.

The staff concluded that the information provided by the applicant for VCS COL 11.5-3 is acceptable. The NRC staff found that the applicant provided a bounding assessment demonstrating its capability to comply with the individual dose criteria in 10 CFR Part 20 and 10 CFR Part 50, Appendix I. In addition, the staff found the applicant's calculation of the population dose to be appropriate for use in assessing the cost-benefit requirements in Appendix I.

The following portion of this technical evaluation section is reproduced from Section 11.3.4 of the VEGP SER:

> *Supplemental Information*
>
> *The following portion of this technical evaluation section is reproduced from Section 11.3.4 of the BLN SER:*
>
> - *STD SUP 11.3-1*
>
> *The applicant provided supplemental information in BLN COL FSAR Section 11.3.3.6, "Quality Assurance," addressing the quality assurance program to be applied to the gaseous waste system and stated that the program complies with the guidance presented in RG 1.143.*
>
> *The NRC staff reviewed this supplemental quality assurance information included in BLN COL FSAR Section 11.3.3.6 and finds that this supplemental statement commits the applicant to the regulatory positions in RG 1.143 related to quality assurance and is acceptable.*

The following portion of this technical evaluation section is reproduced from Section 11.3.4 of the VEGP SER:

> - *STD SUP 11.3-2*
>
> *The applicant provided additional information in VEGP COL FSAR Section 11.3.3 to address gaseous effluent site interface parameters. The applicant stated that there are no gaseous effluent site interface parameters outside the Westinghouse scope. The staff finds this statement true because all gaseous effluent release points are through the main gas vent and the turbine building exhaust and are part of the certified design.*
>
> *Postulated Radioactive Release Due to a Waste Gas Leak or Failure*
>
> *NUREG-0800, Section 11.3, acceptance criteria and BTP 11-5 require the staff to evaluate the results of a postulated radioactive release resulting from a leakage or failure of a waste gas storage tank or offgas charcoal delay bed. The waste gas system is part of the radioactive GWMS and information on the system is considered as part of the design information required by 10 CFR 50.34a.*

The AP1000 DCD and NUREG-1793 addressed the results of this analysis. In response to RAI SRP11.3-CHPB-02 covering AP1000 DCD, Revision 17, Westinghouse detailed the results of this analysis for inclusion in the next revision of the DCD. As documented in the staff's SER for the AP1000 DCD, the staff found this analysis acceptable and that it encompassed the site-specific parameters for the VEGP site. Once the staff confirms the inclusion of the failure analysis in a future revision of the AP1000 DCD and the incorporation by reference of that DCD revision by the VEGP applicant, the staff will consider this item closed for the VEGP COL FSAR. This is considered ***Confirmatory Item 11.3-1****.*

Resolution of Standard Content Confirmatory Item 11.3-1

Confirmatory Item 11.3-1 is a commitment by the applicant to incorporate changes, by reference, proposed by Westinghouse to Section 11.3.3.4 of the AP1000 DCD to include the results of the postulated radioactive release resulting from a leakage or failure of a waste gas storage tank or offgas charcoal delay bed. The staff verified that the applicant has incorporated the AP1000 DCD Revision 18 that includes the above changes. As a result, Confirmatory Item 11.3-1 is now closed.

Demonstrating Compliance with 10 CFR 20.1301(e)

The staff discusses compliance with 10 CFR 20.1301(e) in Section 11.2.4 of this SER.

Demonstrating Compliance with 10 CFR 20.1302

The annual average concentration of radioactive material released in gaseous effluents at the boundary of the unrestricted area must not exceed the values specified in Table 2 of Appendix B to 10 CFR Part 20. The applicant demonstrated compliance with this requirement by referencing the AP1000 DCD. Section 11.3.3.5 of the DCD shows that even at the Technical Specification limit for percent failed fuel defects, the site provides sufficient atmospheric dilution to ensure that the expected effluent release concentrations will be less than those specified in Table 2 of Appendix B to 10 CFR Part 20.

In NUREG-1793, the staff evaluated and accepted the conclusions of Section 11.3.3.5 of the DCD. Based on this acceptance, the staff concludes that the applicant complies with 10 CFR 20.1302.

Demonstrating Compliance with 10 CFR 20.1406

The staff discusses compliance with 10 CFR 20.1406 in Section 11.2.4 of this SER.

Confirmatory Item 11.3-1 remains unresolved for the VCSNS COL FSAR until the staff confirms the site-specific characteristics for the VCSNS site are enveloped by the DCD site parameters. This issue is being tracked as **VCSNS Confirmatory Item 11.3-1**.

Resolution of VCSNS Confirmatory Item 11.3-1

VCSNS Confirmatory Item 11.3-1 is a commitment by the staff to confirm the site-specific characteristics for the VCSNS site are enveloped by the DCD site parameters. The staff reviewed and compared the VCSNS site-specific and DCD parameters and confirmed that the site-specific parameters are enveloped by the DCD parameters. As a result, VCSNS Confirmatory Item 11.3-1 is now closed.

11.3.5 Post Combined License Activities

There are no post-COL activities related to this section.

11.3.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the GWMS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff evaluated the additional COL information (STD COL 11.3-1, VCS COL 11.3-1, VCS COL 11.5-3, STD SUP 11.3-1, and STD SUP 11.3-2) in the application against the relevant NRC regulations, acceptance criteria defined in NUREG-0800, Section 11.3, and other NRC regulatory guides. The applicant has satisfactorily addressed RAIs related to Section 11.3.

STD SUP 11.3-2, related to a postulated radioactive release resulting from a leakage or failure of a waste gas storage tank or offgas charcoal delay bed, is acceptable because it demonstrates compliance with 10 CFR 50.34a.

In other areas of the evaluation of the GWMS, the staff verified that the applicant had provided sufficient information and that the review and calculations support the conclusion that the GWMS includes the equipment necessary to control releases of radioactive materials in gaseous effluents in accordance with GDC 3, 60, and 61 of Appendix A to 10 CFR Part 50 and the requirements of 10 CFR 50.34a. The staff finds that the applicant meets the requirements in GDC 3 by conforming to the guidance in BTP 11-5. The staff finds that the applicant meets the requirements in GDC 60 and 61 by demonstrating conformance to 10 CFR Part 50, Appendix I. The staff also concludes that the design of the GWMS meets the requirements of 10 CFR 20.1301(e), 10 CFR 20.1302, 10 CFR 20.1406, 10 CFR 50.34a, GDC 3, 60, and 61, and Appendix I to 10 CFR Part 50.

11.4 Solid Waste Management (Related to RG 1.206, Section C.III.1, Chapter 11, C.I.11.4, "Solid Waste Management System")

11.4.1 Introduction

The solid waste management system (SWMS) is designed to collect and accumulate spent ion exchange resins and deep-bed filtration media, spent filter cartridges, dry active wastes, and mixed wastes generated from normal plant operation, including anticipated operational occurrences. Processing and packaging of wastes are by mobile systems and the packaged

waste is stored in the auxiliary and radwaste buildings until it is shipped offsite to a licensed disposal facility.

11.4.2 Summary of Application

Section 11.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 11.4 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 11.4, the applicant provided the following:

AP1000 COL Information Items

- STD COL 11.4-1

The applicant provided additional information in STD COL 11.4-1 to address COL Information Item 11.4-1 (COL Action Item 11.4-1). The additional information provides a process control program (PCP) for both wet and dry solid wastes.

Supplemental Information

- STD SUP 11.4-1

The applicant added supplemental information in VCSNS COL FSAR Section 11.4.5 to address how the solid radwaste system complies with the guidance in RG 1.143. STD SUP 11.4-1 also addresses the processes to be followed to ship waste that complies with 10 CFR 61.55, "Waste classification," and 10 CFR 61.56, "Waste characteristics" in VCSNS COL FSAR Section 11.4.6.1.

License Condition

- Part 10, License Condition 3, Operational Program Implementation

VCSNS COL FSAR Section 13.4, Table 13.4-201, "Operational Programs Required by NRC Regulations," identifies Item 9, the PCP, as a program required by regulations that must be implemented by a milestone (prior to initial fuel load) to be identified as a license condition.

- Part 10, License Condition 6, Operational Program Readiness

The applicant proposed a license condition to provide a schedule to support NRC inspection of operational programs including the PCP.

11.4.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the regulatory basis for acceptance of the supplemental information on the SWMS is established in several codes and standards. These include:

- 10 CFR Part 20
- 10 CFR Part 50
- 10 CFR 52.79, "Contents of applications; technical information in final safety analysis report"
- 10 CFR Part 71, "Packaging and transportation of radioactive material"
- 49 CFR Part 173, "Shippers—General requirements for shipments and packagings"
- State regulations and disposal site waste form requirements for burial at a low-level waste disposal site that is licensed in accordance with 10 CFR Part 61, "Licensing requirements for land disposal of radioactive waste," or equivalent State regulations
- Table 1 and Regulatory Positions C.3.2 and C.3.3 of RG 1.143, Revision 2

The acceptance criteria associated with the SWMS are given in NUREG-0800, Section 11.4, including BTP 11-3.

11.4.4 Technical Evaluation

The NRC staff reviewed Section 11.4 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the SWMS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff's review of this application included the following COL information item and supplemental information:

- STD COL 11.4-1, Solid Waste Management System PCP
- STD SUP 11.4-1, Quality Assurance

In addition to the above items, the staff reviewed the entire section against NUREG-0800, Section 11.4, to determine if the information in VCSNS COL FSAR Section 11.4 met the regulatory requirements in the regulations stated above (SER Section 11.4.3) and NUREG-0800 acceptance criteria. The relevant NUREG-0800 acceptance criteria are as follows:

- All effluent releases (gaseous and liquid) associated with the operation (normal and anticipated operational occurrences) of the SWMS will comply with 10 CFR Part 20 and RG 1.143, as they relate to the definition of the boundary of the SWMS beginning at the interface from plant systems, including multiunit stations, to the points of controlled liquid

and gaseous effluent discharges to the environment or designated onsite storage locations, as defined in the PCP and ODCM.

- Operational Programs. For COL reviews, the description of the operational program and proposed implementation milestone for the PCP aspect of the Process and Effluent Monitoring and Sampling Program are reviewed in accordance with 10 CFR 20.1301; 10 CFR 20.1302; 10 CFR 50.34a; 10 CFR 50.36a, "Technical specifications on effluents from nuclear power reactors"; and 10 CFR Part 50, Appendix I, Sections II and IV. Its implementation is required by a license condition.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP, Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

Although the staff concluded that the evaluation performed for the standard content is directly applicable to the VCSNS COL application, there is a difference in how the VCSNS applicant addressed STD COL 11.4-1 and how the VEGP applicant addressed this review item. This difference is evaluated by the staff below, following the standard content material for STD COL 11.4-1.

The following portion of this technical evaluation section is reproduced from Section 11.4.4 of the VEGP SER:

AP1000 COL Information Items

The following portion of this technical evaluation section is reproduced from Section 11.4.4 of the BLN SER:

- *STD COL 11.4-1*

The applicant provided additional information in STD COL 11.4-1 to resolve COL Information Item 11.4-1. COL Information Item 11.4-1 states:

> *The Combined License applicant will develop a process control program in compliance with 10 CFR Sections 61.55 and 61.56 for wet solid wastes and 10 CFR Part 71 and DOT regulations for both wet and dry solid wastes. Process control programs will also be provided by vendors providing mobile or portable processing or storage systems. It will be the plant operator's responsibility to assure that the vendors have appropriate process control programs for the scope of work being contracted at any particular time. The process control program will identify the operating procedures for storing or processing wet solid wastes. The mobile systems process control program will include a discussion of conformance to Regulatory Guide 1.143, Generic Letter GL-80-009, and Generic Letter GL-81-039 and, information of equipment containing wet solid wastes in the non-seismic Radwaste Building. In the event additional onsite storage facilities are a part of Combined License plans, this program will include a discussion of conformance to Generic Letter GL-81-038.*

The commitment was also captured as COL Action Item 11.4-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will develop a process control program for both wet and dry solid wastes.*

In BLN COL FSAR Section 11.4.6, the applicant addressed this COL information item. The applicant adopted NEI 07-10, "FSAR Template Guidance for Process Control Program (PCP) Description." The PCP describes the administrative and operational controls used for the solidification of liquid or wet solid waste and the dewatering of wet solid waste. It provides the necessary controls such that the final disposal waste product meets applicable federal regulations (10 CFR Parts 20, 50, 61, 71 and 49 CFR Part 173), state regulations, and disposal site waste form requirements for burial at a low level waste disposal site licensed in accordance with 10 CFR Part 61. Waste processing equipment and services may be provided by the plant or by third-party vendors. In a letter dated January 8, 2009, (ML082910077), the NRC accepted NEI 07-10, Revision 3. Specifically, the NRC staff indicated that for COL applications NEI 07-10, Revision 3, provides an acceptable template for assuring that the administrative and operational controls for waste processing, processing parameters, and

surveillance requirements within the scope of the PCP will meet the requirements of 10 CFR 52.79. In a letter dated April 23, 2009 (ML091170073), the applicant proposed to revise BLN FSAR Section 11.4 to incorporate the approved NEI 07-10 Revision 3. Since the BLN COL FSAR Section 11.4 has not adopted the approved version of the NEI Template, this is ***Confirmatory Item 11.4-1.*** *Each process used meets the applicable requirements of the PCP. BLN COL FSAR Table 13.4-201 provides milestones for PCP implementation and is acceptable.*

In STD COL 11.4-1, the applicant states that "no additional onsite radwaste storage is required beyond that described in the DCD." The applicant should explain why this statement is included or should remove it. In section 11.4 of NUREG-1793, the staff stated that if a need for onsite storage of low-level waste has been identified beyond that provided in AP1000 Standard Design because of unavailability of offsite storage, the applicant should submit the details of any proposed onsite storage facility to the NRC. The applicant needs to provide any arrangements for offsite storage for low-level waste or to submit plans for onsite storage. This is identified as ***Open Item 11.4-1****.*

The following portion of this technical evaluation section is reproduced from Section 11.4.4 of the VEGP SER:

Resolution of Standard Content Confirmatory Item 11.4-1

To address Confirmatory Item 11.4-1 in the BLN SER with open items, the applicant updated VEGP COL FSAR Section 11.4.6 to indicate adoption of the NRC-approved version of NEI 07-10A. VEGP adoption of this template effectively resolves Confirmatory Item 11.4-1.

Resolution of Standard Content Open Item 11.4-1

To address Open Item 11.4-1 in the BLN SER with open items, the applicant updated VEGP COL FSAR Section 11.4 with information supporting the statement that no additional onsite radwaste storage was required beyond that described in the DCD. This additional information is in VEGP COL 11.4-1 and VEGP SUP 11.4-1 and is evaluated below.

Evaluation of Site-specific Information for STD COL 11.4-1

Regarding the Resolution of Standard Content Open Item 11.4-1, the staff does not consider the open item relevant to the VCSNS COL application because the applicant has available offsite disposal of all types of low-level radioactive waste through its membership in the Atlantic Compact. Therefore, an update of the VCSNS COL FSAR is not necessary to resolve this item.

The following portion of this technical evaluation section is reproduced from Section 11.4.4 of the VEGP SER:

Supplemental Information

The following portion of this technical evaluation section is reproduced from Section 11.4.4 of the BLN SER:

- *STD SUP 11.4-1*

The applicant provided supplemental information in Section 11.4.5 of the BLN COL FSAR to describe the QA program applicable to design, construction, installation and testing provisions of the solid radwaste system. This QA program is established by procedures and complies with the guidance presented in RG 1.143.

In BLN FSAR Section 11.4.6, the applicant also added a description of procedures relating to waste shipments, waste stream processing, verifying waste as non-radioactive, periodic system maintenance, personnel training, and document revision, clearing with third party vendors. The staff reviewed the descriptions and found them to be comprehensive and acceptable.

The NRC staff reviewed the supplemental information provided in STD SUP 11.4-1 related to the QA program for the solid radwaste system included under Section 11.4.4 of the BLN COL FSAR and finds that this supplemental statement commits the applicant to the regulatory positions in RG 1.143 related to quality assurance.

License Conditions

- *Part 10, License Condition 3, Operational Program Implementation*

VEGP COL FSAR Section 11.4.6 describes the process control program. VEGP COL FSAR Table 13.4-201 provides the milestone (prior to initial fuel load) for implementation of the process control program and is acceptable as described in the staff's SER related to NEI 07-10.

- *Part 10, License Condition 6, Operational Program Readiness*

The applicant proposed a license condition to provide a schedule to support NRC inspection of operational programs including the process control program. The proposed license condition is consistent with the policy established in SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria [ITAAC]," and is acceptable.

Compliance with 10 CFR Part 50 Appendix I Design Criteria

The design of the SWMS described in the AP1000 DCD has no release points directly to the environment. Compliance with Appendix I ALARA criteria is strictly based on the releases from the LWMS and GWMS and not the SWMS.

11.4.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff finds the following two license conditions proposed by the applicant acceptable:

- License Condition (11-1) - Prior to initial fuel load, the licensee shall implement an operational program for process and effluent monitoring and sampling. The program shall include the subprogram and documents for a Process Control Program.

- License Condition (11-2) - No later than 12 months after issuance of the COL, the licensee shall submit to the Director of the Office of New Reactors (NRO) a schedule that supports planning for and conduct of NRC inspections of the operational program for process and effluent monitoring and sampling (including process control program). The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the operational program for process and effluent monitoring and sampling (including process control program) has been fully implemented.

11.4.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the SWMS, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff evaluated the additional COL information (STD COL 11.4-1 and STD SUP 11.4-1) in the application against the relevant NRC regulations, acceptance criteria in NUREG-0800, Section 11.4, and other NRC regulatory guides. The applicant has satisfactorily addressed the RAIs related to VCSNS COL FSAR Section 11.4.

The staff verified that the applicant had provided sufficient information and that the review supports the conclusion that the design and operation of the SWMS, which discharges radioactive releases through the LWMS and GWMS, is acceptable and meets the requirements of GDC 3, 60, and 61 of Appendix A of 10 CFR Part 50, 10 CFR 50.34a, 10 CFR 20.1301(e), 10 CFR 20.1406, and Appendix I to 10 CFR Part 50, and 10 CFR Parts 61 and 71.

11.5 Radiation Monitoring (Related to RG 1.206, Section C.III.1, Chapter 11, C.I.11.5, "Process and Effluent Radiological Monitoring and Sampling Systems")

11.5.1 Introduction

The radiation monitoring systems are used to monitor liquid and gaseous process streams and effluents from the LWMS, GWMS, and SWMS. The radiation monitoring system includes

subsystems used to collect process and effluent samples during normal operation and anticipated operational occurrences and under post-accident conditions.

11.5.2 Summary of Application

Section 11.5 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 11.5 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 11.5, the applicant provided the following:

AP1000 COL Information Items

- STD COL 11.5-1

The applicant provided additional information in STD COL 11.5-1 to resolve COL Information Item 11.5-1 (COL Action Item 11.5-1). The information addresses the ODCM.

- STD COL 11.5-2

The applicant provided additional information in STD COL 11.5-2 to resolve COL Information Item 11.5-2 (COL Action Item 11.5-2). The information provides programmatic aspects of the effluent monitoring and sampling program.

- VCS COL 11.5-2

The applicant provided additional information in VCS COL 11.5-2 to add language to VCSNS COL FSAR Section 11.5.3 addressing extension of the existing Unit 1 program for QA of radioactive effluent and environmental monitoring to apply to VCSNS Units 2 and 3.

- VCS COL 11.5-3

The applicant provided additional information in VCS COL 11.5-3 to resolve COL Information Item 11.5-3 (COL Action Item 11.5-3). The information relates to the 10 CFR Part 50, Appendix I guidelines.

License Conditions

- Part 10, License Condition 3, Operational Program Implementation, Item G.3

VCSNS COL FSAR Section 13.4, Table 13.4-201, "Operational Programs Required by NRC Regulations," identifies three entries under Item 9, "Process and Effluent Monitoring and Sampling Program," as follows: (1) Radiological Effluent Technical Specifications/Standard Radiological Effluent Controls; (2) Offsite Dose Calculation Manual; and (3) Radiological Environmental Monitoring program, as programs identified in FSAR Section 11.5 that are required to be implemented by a milestone. In accordance with License Condition 3, Item G.3, these programs are to be implemented prior to initial fuel load.

- Part 10, License Condition 6, Operational Program Readiness

The applicant proposed a license condition to provide a schedule to support the NRC's inspection of operational programs including the Radiological Effluent Technical Specifications/Standard Radiological Effluent Controls; the ODCM; and the Radiological Environmental Monitoring program.

11.5.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the regulatory basis for acceptance of the supplementary information on radiation monitoring addressed in COL Information Items 11.5-1, 11.5-2, and 11.5-3 is established in the requirements and guidelines of:

- 10 CFR Part 50, Appendix A, GDC 64, "Monitoring Radioactivity Releases"
- 10 CFR Part 20
- 10 CFR Part 50
- 10 CFR Part 52, "Licenses, certifications, and approvals for nuclear power plants"
- 10 CFR Part 61
- 10 CFR Part 71
- American National Standards Institute/Health Physics Society (ANSI/HPS) N13.1, "Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities"
- ANSI N42.18, "Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents"
- RG 1.21, "Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste," Revision 2
- RG 4.15, "Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination) – Effluent Streams and the Environment," Revision 2

The applicable acceptance criteria associated with the radiation monitoring system are given in NUREG-0800, Section 11.5.

11.5.4 Technical Evaluation

The NRC staff reviewed Section 11.5 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed

that the information in the application and incorporated by reference addresses the required information relating to the radiation monitoring system. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

AP1000 COL Information Items

- STD COL 11.5-1, ODCM
- STD COL 11.5-2, Programmatic Aspects of the Effluent Monitoring and Sampling Program
- VCS COL 11.5-2 adds language to VCSNS COL FSAR Section 11.5.3 addressing extension of the existing Unit 1 program for QA of radioactive effluent and environmental monitoring to apply to VCSNS Units 2 and 3.
- VCS COL 11.5-3, 10 CFR Part 50, Appendix I Guidelines

In addition to the above items, the staff reviewed the entire section against NUREG-0800, Section 11.5, to determine if the information in VCSNS COL FSAR Section 11.5 met the regulatory requirements in the regulations stated above (SER Section 11.5.3) and NUREG-0800 acceptance criteria. The relevant NUREG-0800 acceptance criteria are as follows:

- Provisions should be made to ensure representative sampling from radioactive process streams and tank contents. Recirculation pumps for liquid waste tanks (collection or sample test tanks) should be capable of recirculating at a rate of not less than two tank volumes in 8 hours. For gaseous and liquid process stream samples, provisions should be made for purging sampling lines and for reducing the plate-out of radioactive materials in sample lines. Provisions for gaseous sampling from ducts and stacks should be consistent with ANSI/HPS N13.1-1999.
- For COL reviews, the description of the operational program and proposed implementation milestone for the radiological effluent technical specification/standard radiological effluent control, ODCM and Radiological Environmental Monitoring Program aspects of the Process and Effluent Monitoring and Sampling Program are reviewed in accordance with 10 CFR 20.1301, 10 CFR 20.1302, 10 CFR 50.34a, 10 CFR 50.36a, and 10 CFR Part 50, Appendix I, Sections II and IV. Its implementation is required by a license condition.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP, Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 11.5.4 of the VEGP SER:

AP1000 COL Information Items

The following portion of this technical evaluation section is reproduced from Section 11.5.4 of the BLN SER:

- *STD COL 11.5-1*

The applicant provided additional information in STD COL 11.5-1 to resolve COL Information Item 11.5-1. COL Information Item 11.5-1 states:

> *The Combined License applicant will develop an offsite dose calculation manual that contains the methodology and parameters used for calculation of offsite doses resulting from gaseous and liquid effluents. The Combined License applicant will address operational setpoints for the radiation monitors and address programs for monitoring and controlling the release of radioactive material to the environment, which eliminates the potential for unmonitored and uncontrolled release. The offsite dose calculation manual will include planned discharge flow rates.*

This commitment was also captured as COL Action Item 11.5-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will develop an offsite dose calculation manual that contains the methodology and parameters used to calculate offsite doses resulting from gaseous and liquid effluents.*

In BLN COL FSAR Section 11.5.7, the applicant adopts NEI 07-09, "FSAR Template Guidance for Offsite Dose Calculation Manual (ODCM) Program Description." The ODCM program description contains: (1) the methodology and parameters used for calculating doses resulting from liquid and gaseous

effluents; (2) operational setpoints, including planned discharge rates, for radiation monitors and monitoring programs; and (3) the limitations on operation of the radwaste systems, including functional capability of monitoring instruments, concentrations of effluents, sampling, analysis, 10 CFR Part 50, Appendix I dose and dose commitments and reporting. In a letter dated January 27, 2009 (ML083530745), the NRC accepted NEI 07-09, Revision 4. Specifically, the NRC indicated that for COL applications, NEI 07-09, Revision 4 provides an acceptable template assuring that the ODCM program meets applicable NRC regulations and guidance. In a letter dated April 23, 2009 (ML091170073), the applicant proposed to revise BLN COL FSAR Section 11.5 to incorporate the approved NEI 07-09, Revision 4. Since the BLN COL FSAR Section 11.5 has not adopted the approved version of the NEI Template, this is ***Confirmatory Item 11.5-1****. BLN COL FSAR Table 13.4-201 provides milestones for ODCM implementation. This section also addresses Plant Interface Item 11.4, "requirements for offsite sampling and monitoring of effluent concentrations." The staff finds the applicant's consideration of Plant Interface Item 11.4 to be acceptable based on a review of the ODCM program (NEI 07-09). The NRC staff reviewed the resolution of STD COL 11.5-1 related to the ODCM included under Section 11.5.7 of the BLN COL FSAR and considers it adequately addressed in NEI 07-09.*

The following portion of this technical evaluation section is reproduced from Section 11.5.4 of the VEGP SER:

<u>Resolution of Standard Content Confirmatory Item 11.5-1</u>

To address Confirmatory Item 11.5-1, the applicant updated the VEGP FSAR Section 11.5.7 to indicate adoption of the NRC-approved version of NEI 07-09A. VEGP adoption of this template effectively resolves Confirmatory Item 11.5-1.

The following portion of this technical evaluation section is reproduced from Section 11.5.4 of the BLN SER:

- *STD COL 11.5-2*

The applicant provided additional information in STD COL 11.5-2 to resolve COL Information Item 11.5-2 (COL Action Item 11.5-2).
COL Information Item 11.5-2 states:

> *The Combined License applicant is responsible for the site-specific and program aspects of the process and effluent monitoring and sampling in accordance with ANSI N13.1 and RGs 1.21 and 4.15.*

The commitment was also captured as COL Action Item 11.5-2 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant is responsible for ensuring that the process and effluent monitoring and sampling program at its site conforms to the guidelines of ANSI N13.1-1969, RG 1.21, and RG 4.15.*

In BLN COL FSAR Sections 11.5.1.2, 11.5.2.4, 11.5.4, 11.5.4.1, 11.5.4.2 and 11.5.6.5, the applicant described the programmatic aspects of the effluent monitoring and sampling program. In addition, the applicant provided in BLN COL 11.5-2 specific language regarding the applicant's extension of the existing TVA program for quality assurance of radiological effluent and environmental monitoring which is based on RG 4.15, Revision 1, instead of the most current Revision 2. To maintain consistency, the applicant proposes to apply the same program to BLN Units 3 and 4.

The NRC staff reviewed the resolution of BLN COL 11.5-2 related to the effluent monitoring and sampling program included under Sections 11.5.1.2, 11.5.2.4, 11.5.3, 11.5.4, 11.5.4.1, 11.5.4.2 and 11.5.6.5 of the BLN COL FSAR and considers it adequately addressed in NEI 07-09.

- VCS COL 11.5-2

In VCS COL 11.5-2, the applicant extended the existing, NRC-approved SCE&G QA program, including RG 4.15, Revision 1, for effluent and environmental monitoring, to Units 2 and 3. By using the current program, which is based on RG 4.15, Revision 1 instead of Revision 2, the applicant will avoid confusion and the potential for error because the program for the existing and planned units will share the same equipment and personnel. Therefore, the staff finds the use of RG 4.15, Revision 1, acceptable.

- VCS COL 11.5-3

The applicant provided additional information in VCS COL 11.5-3 to resolve COL Information Item 11.5-3, which states:

> The Combined License applicant is responsible for addressing the 10 CFR 50, Appendix I guidelines for maximally exposed offsite individual doses and population doses via liquid and gaseous effluents.

The commitment was also captured as COL Action Item 11.5-3 in Appendix F of NUREG-1793, which states:

> The COL applicant is responsible for addressing the guidelines of Appendix I to 10 CFR Part 50, as they relate to maximally exposed offsite individual doses and population doses attributable to liquid and gaseous effluents.

The applicant addressed this COL item by adding information to VCSNS COL FSAR Sections 11.2.3 and 11.3.3.4 for liquid and gaseous effluents, respectively.

The NRC staff reviewed the resolution of VCS COL 11.5-3 related to compliance with 10 CFR Part 50, Appendix I, as discussed in SER Sections 11.2.4 and 11.3.4, and considers it adequately addressed.

The following portion of this technical evaluation section is reproduced from Section 11.5.4 of the VEGP SER:

> *The following portion of this technical evaluation section is reproduced from Section 11.5.4 of the BLN SER:*

Section 11.5.4.2, Representative Sampling

In this section, the applicant describes how it will take representative samples for analysis. Based on the staff's review, the staff issued RAIs 11.5-1 and 11.5-2. RAI 11.5-1 requested clarification about the use of ANSI/HPS N13.1-1999. RAI 11.5-2 requested more information concerning how the applicant ensures representative liquid effluent and environmental sampling.

In response to RAI 11.5-1, the applicant revised its commitment to use the 1999 standard. Because the applicant made no changes to the certified design, it removed the commitment to use ANSI/HPS N13.1-1999, and committed to ANSI N13.1-1969 to be consistent with the AP1000 certified design. ANSI withdrew the 1969 standard and replaced it with ANSI/HPS N13.1-1999 because the approach taken in the 1969 standard did not provide assurance that the sample in the effluent vent would be representative. The 1999 standard differs significantly from the earlier version in that it is now performance based. NUREG-0800 Section 11.5 (2007) uses the 1999 standard as acceptance criteria. The staff is pursuing this issue through the DC because it deals with the design of the sampling systems for radioactive gas streams.

The applicant provided a response to RAI 11.5-2 and the staff finds the response acceptable. The response provided a more detailed description of how the applicant will assure that liquid samples will be representative. The applicant committed to follow the recommendations in ANSI N42.18 and RG 1.21. In addition, the applicant provided more operational descriptions for composite sampling. The NRC staff verified that Revision 1 of the BLN COL FSAR adequately addressed the above. As a result, RAI 11.5-2 is closed.

The following portion of this technical evaluation section is reproduced from Section 11.5.4 of the VEGP SER:

License Conditions

- *Part 10, License Condition 3, Operational Program Implementation, Item G.3*

VEGP COL FSAR Section 11.5.3 describes effluent monitoring and sampling and Section 11.5.7 describes the offsite dose calculation manual. License Condition 3, Item G.3 requires the licensee to implement the "Process and Effluent Monitoring and Sampling" program prior to initial fuel load. VEGP COL FSAR Section 13.4, Table 13.4-201, "Operational Programs Required by NRC Regulations," identifies three entries under Item 9, "Process and Effluent Monitoring and Sampling Program," as follows: (1) Radiological Effluent Technical Specifications/Standard Radiological Effluent Controls, (2) Offsite Dose Calculation Manual; and (3) Radiological Environmental Monitoring program, as programs identified in FSAR Section 11.5 required to be implemented by a milestone. The ODCM includes the Radiological Effluent Technical Specifications/Standard Radiological Effluent Controls and the Radiological Environmental Monitoring program. In accordance with License Condition 3, Item G.3, these programs are to be implemented prior to initial fuel

load. VEGP COL FSAR Table 13.4-201 provides the milestones (prior to initial fuel load) for implementation of these elements of the Process and Effluent Monitoring and Sampling Program and is acceptable as described in the staff's SER related to NEI 07-09.

- *Part 10, License Condition 6, Operational Program Readiness*

The applicant proposed a license condition to provide a schedule to support NRC inspection of operational programs, including the ODCM, effluent technical specifications, and the radiological environmental monitoring program. The proposed license condition is consistent with the policy established in SECY-05-0197 and is acceptable.

11.5.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff finds the following two license conditions proposed by the applicant acceptable:

- License Condition (11-3) - Prior to initial fuel load, the licensee shall implement an operational program for process and effluent monitoring and sampling. The program shall include the following subprograms and documents:

    a. Radiological Effluent Technical Specifications/Standard Radiological Effluent Controls

    b. Offsite Dose Calculation Manual

    c. Radiological Environmental Monitoring Program

- License Condition (11-4) - No later than 12 months after issuance of the COL, the licensee shall submit to the Director of NRO a schedule that supports planning for and conduct of NRC inspections of the operational program for process and effluent monitoring and sampling (including Radiological Effluent Technical Specifications/Standard Radiological Effluent Controls, Offsite Dose Calculation Manual, and Radiological Environmental Monitoring Program). The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the above operational program has been fully implemented.

11.5.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the radiation monitoring system, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff evaluated the additional COL information (STD COL 11.5-1, STD COL 11.5-2, VCS COL 11.5-2, and VCS COL 11.5-3) in the application against the relevant NRC regulations, acceptance criteria defined in NUREG-0800, Section 11.5, and other

NRC regulatory guides. The applicant has satisfactorily addressed all RAIs related to Section 11.5.

The staff verified that the applicant has provided sufficient information and that the review supports the conclusion that follows: The staff concludes that the Process and Effluent Radiological Monitoring and Sampling Systems are sufficient to comply with applicable portions of GDC 64 of Appendix A of 10 CFR Part 50; applicable requirements of 10 CFR Parts 20, 50, and 52; ANSI/HPS N13.1; ANSI N42.18; RGs 1.21 and 4.15; and applicable acceptance criteria in NUREG-0800, Section 11.5.

Table 11.2-1. Adult Total Body Dose from Normal Effluent Releases for Each Pathway

Pathway	Normal Effluent Release Adult Total Body Dose (mrem/yr)
Fish	2.1E-2
Drinking water	1.1E-2
Shoreline	2.1E-5
Irrigated Vegetables	9.5E-3
Irrigated Leafy Vegetables	1.2E-3
Irrigated Milk	6.3E-3
Irrigated Meat	2.0E-3
Total	5.1E-2

Table 11.2-2. Comparison of Important Modeling Assumptions

Pathways and Parameters	Application	NRC Staff's Analysis
Drinking water pathway for MEI and population	Yes	Yes
Fish ingestion pathway for MEI and population	Yes	Yes
Recreational use of river for MEI and population	Yes	Yes
Irrigation pathway for the MEI (including irrigated vegetable ingestion and ingestion of milk and meat from livestock grazing on irrigated land)	Yes	Yes
Surface Water Dilution Model	Mixing with Broad River	Mixing with Broad River

Table 11.2-3. Modeling Parameter Values*

Parameter	Value	Basis
Annual radionuclide release (Ci/yr)	Multiple values	DCD Table 11.2-7
Effluent discharge rate (cfs)	1782	FSAR Table 11.2-202
Annual average river flow for the MEI doses (cfs)	1782	FSAR Table 11.2-201
Dilution factors	1	FSAR Table 11.2-201
Transit time (hr)	0.1 for MEI 96 for others	FSAR Table 11.2-202
Reconcentration model	None	FSAR Table 11.2-202
Population drinking lake water	299,930	FSAR Table 11.2-202
Sport fishing harvest (kg/yr)	377,000	FSAR Table 11.2-202
Commercial fishing harvest (kg/yr)	12,100,000	FSAR Table 11.2-202
Fraction of SC crops irrigated	0.0696	FSAR Table 11.2-202
Fraction of population using contaminated water for drinking and food production	0.141	FSAR Table 11.2-202
Fraction of SC agricultural products within 50 mile radius	0.258	FSAR Table 11.2-202
Irrigation rate for food products (l/m^2/mon)	110	FSAR Table 11.2-202
Fraction of contaminated water not used for feed or drinking water	0	FSAR Table 11.2-202
Total production of vegetables within 50 mi radius (kg/yr)	6.86E+07	FSAR Table 11.2-202
Production rate for irrigated vegetables (kg/yr)	6.71E+05	FSAR Table 11.2-202
Total production of leafy vegetables within 50 mi radius (kg/yr)	1.80E+07	FSAR Table 11.2-202
Production rate for irrigated leafy vegetables (kg/yr)	1.76E+05	FSAR Table 11.2-202
Total production of milk within 50 mi radius (l/yr)	6.78E+07	FSAR Table 11.2-202
Production rate for irrigated milk (l/yr)	6.63E+05	FSAR Table 11.2-202
Total production of meat within 50 mi radius (kg/yr)	9.15E+08	FSAR Table 11.2-202
Production rate for irrigated meat (kg/yr)	8.96E+06	FSAR Table 11.2-202
Swimming/Boating/Shoreline usage (person-hours per year)	359,000 for Swimming 3,590,000 for Others	FSAR Table 11.2-202

* The staff used LADTAP II default values for parameters not listed in the table.

Table 11.2-4. Comparison of Maximum Individual Doses (mrem/yr)

Organ/Body	Application*	10 CFR Part 50 Appendix I Section II.A
GI-LLI	5.0E-01	10
Total Body	1.4E-01	3
Thyroid	1.9E-01	10

* Taken from VCSNS COL FSAR Table 11.2-203.

Table 11.2-5. Comparison of Maximum Individual Doses to 40 CFR Part 190 (mrem/yr)

Organ/Body	Application*	40 CFR Part 190
Total Body	2.2	25
Thyroid	14	75
Other Organ (Bone)	3.5	25

* Taken from VCSNS COL FSAR Table 11.3-206

Table 11.3-1. Comparison of Maximum Annual Individual Doses

Description	Application	10 CFR Part 50 Appendix I Section II.B and II.C
<u>Noble Gases</u>		
• Gamma Dose (mrad)	0.71*	10
• Beta Dose (mrad)	3.0*	20
• Total Body (mrem)	0.58**	5
• Skin (mrem)	2.4*	15
<u>Radioiodines and Particulates</u>		
• Maximum Organ (mrem)	7.0**	15

* Taken from VCSNS COL FSAR Table 11.3-204
** Dose for the infant thyroid

Table 11.3-2. Comparison of Population Doses (person-rem/yr)

Organ/Body	Application*	NRC Staff's Analysis
Total Body	2.7	2.7
Thyroid	6.4	6.4

* Taken from VCSNS COL FSAR Table 11.3-205

12.0 RADIATION PROTECTION

This chapter provides information on radiation protection methods and estimated occupational radiation exposures of operating and construction personnel during normal operation and anticipated operational occurrences (AOOs). AOOs may include refueling; fuel handling and storage; radioactive material handling, processing, use, storage, and disposal; maintenance; routine operational surveillance; inservice inspection (ISI); and calibration. Specifically, this chapter provides information on facility and equipment design, planning and procedures programs, and techniques and practices employed by the applicant to meet the radiation protection standards set forth in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, "Standards for protection against radiation," and to be consistent with the guidance given in the appropriate regulatory guides (RGs), where the practices set forth in such guides are used to implement Nuclear Regulatory Commission (NRC) regulations.

12.1 Assuring That Occupational Radiation Exposures Are As-Low-As-Reasonably Achievable (ALARA) (Related to RG 1.206, Section C.III.1, Chapter 12, C.I.12.1, "Ensuring that Occupational Radiation Exposures are As Low As Is Reasonably Achievable")

12.1.1 Introduction

Section 12.1 addresses policy and design considerations to ensure that the occupational radiation exposure (ORE) to personnel will be kept ALARA. The ALARA program is addressed in this section and in Appendix 12AA of the V.C. Summer Nuclear Station (VCSNS) combined license (COL) Final Safety Analysis Report (FSAR).

12.1.2 Summary of Application

Section 12.1 of the VCSNS COL FSAR, Revision 5 incorporates by reference Section 12.1 of the AP1000 Design Control Document (DCD), Revision 19.

In addition, in VCSNS COL FSAR Section 12.1, the applicant provided the following:

AP1000 COL Information Items

- STD COL 12.1-1

The applicant provided additional information in Standard (STD) COL 12.1-1 to resolve COL Information Item 12.1-1 (COL Action Item 12.2.1-1), which addresses ALARA and operational policies and compliance with RGs. The applicant provided additional information to incorporate Nuclear Energy Institute (NEI) 07-08A, "Generic FSAR Template Guidance for Ensuring That Occupational Radiation Exposures Are As Low As Is Reasonably Achievable (ALARA)" into VCSNS COL FSAR Section 12.1 and NEI 07-03A, "Generic FSAR Template Guidance for Radiation Protection Program Description," in Appendix 12AA.

The applicant also revised the last sentence of NEI 07-08A, Section 12.1.2 to state that ALARA procedures are consistent with 10 CFR 20.1101, "Radiation protection programs," and the quality assurance criteria described in Part III of the Quality Assurance Program Description. This change was not evaluated by the staff because it is self-evident that the change is consistent with requirements.

Supplemental Information

- STD SUP 12.1-1

The applicant provided supplemental (SUP) information by addressing equipment layout at the end of AP1000 DCD Section 12.1.2.4.

12.1.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the ALARA program are given in Section 12.1 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)."

The applicable regulatory requirements and guidance for STD COL 12.1-1 and STD SUP 12.1-1 are as follows:

- 10 CFR Part 20
- 10 CFR 20.1101
- 10 CFR 19.12, "Instructions to workers"
- RG 1.8, "Qualification and Training of Personnel for Nuclear Power Plants," Revision 3
- RG 1.33, "Quality Assurance Program Requirements (Operation)," Revision 2
- RG 1.97, "Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants," Revision 4
- RG 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be as Low as is Reasonably Achievable," Revision 3
- RG 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as is Reasonably Achievable," Revision 1-R
- NUREG-1736, "Consolidated Guidance: 10 CFR Part 20 – Standards for Protection Against Radiation"

12.1.4 Technical Evaluation

The NRC staff reviewed Section 12.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the

complete scope of information relating to this review topic.[12] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to ensuring that the ORE to personnel will be kept ALARA. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this safety evaluation report (SER) provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (Vogtle Electric Generating Plant [VEGP] Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs).

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 12.1.4 of the VEGP SER:

> *The following portion of this technical evaluation section is reproduced from Section 12.1.4 of the BLN SER.*
>
> *AP1000 COL Information Item*
>
> - *STD COL 12.1-1*
>
> *The applicant provided additional information in STD COL 12.1-1, related to ALARA and Operational Policies, to resolve COL Information Item 12.1-1. COL Information Item 12.1-1 states:*
>
> > *Operational considerations of ALARA, as well as operational policies and continued compliance with 10 CFR 20 and RGs 1.8, 8.8, and 8.10, will be addressed by the Combined Operating License applicant. In addition, the Combined Operating*

[12] See Section 1.2.2 for a discussion of the staff's review related to verification of the scope of information to be included in a COL application that references a design certification (DC).

License applicant will address operational considerations of the Standard Review Plan to the level of detail provided in RG 1.70. RGs that will be addressed include: 8.2, 8.7, 8.9, 8.13, 8.15, 8.20, 8.25, 8.26, 8.27, 8.28, 8.29, 8.34, 8.35, 8.36, and 8.38.

The commitment was also captured as COL Action Item 12.2.1-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

The COL applicant will review all plant procedures and modification plans that involve personnel radiation exposure to ensure that the ALARA policy is applied. In addition, a COL applicant referencing the AP1000 certified design will address operational ALARA concerns and will submit an operational ALARA policy which conforms to the requirements of 10 CFR Part 20 and the recommendations of Revision 2 to RG 1.8, RG 8.8, and Revision 1-R to RG 8.10.

In response to COL Action Item 12.2.1-1 in the BLN COL FSAR (Revision 1) as STD COL 12.1-1:

This section incorporates by reference [Nuclear Energy Institute] NEI 07-08 "Generic FSAR Template Guidance for Ensuring That Occupational Radiation Exposures Are As Low As Is Reasonably Achievable (ALARA)," Revision 2, which is currently under review by the NRC staff. See Table 1.6-201. ALARA practices are developed in a phased milestone approach as part of the procedures necessary to support the Radiation Protection Program. Table 13.4-201 describes the major milestones for ALARA procedures development and implementation.

STD COL 12.1-1 includes a commitment to the use of a "Generic FSAR Template Guidance for Ensuring That Occupational Radiation Exposures Are as Low as Is Reasonably Achievable (ALARA)," as an operational program document, based on draft NEI Template 07-08, Revision 2. The NEI template presents the functional elements of an ALARA program, which, if met, would demonstrate compliance with 10 CFR 20.1101 and 10 CFR 19.12. Accordingly, BLN FSAR Section 12.1, STD COL 12.1-1 needs to be updated as to its commitment to the final NEI ALARA template if it is accepted by the NRC staff. Therefore, the staff cannot find the applicant's reference to the NEI 07-08 template to be acceptable until the staff completes its review of this template as a method to meet the regulatory requirements of an ALARA program, and the BLN FSAR is updated to reference the final version of this template. This is identified as ***Open Item 12.1-1****.*

The NRC staff review finds that BLN FSAR Section 12.1 and Appendix 12AA describe programs and procedures that ensure ORE will be ALARA in accordance with the training requirements in 10 CFR 19.12 and the ALARA provisions of 10 CFR 20.1101(b). The ALARA policy will be described, displayed, and implemented in accordance with the provisions of RG 8.8 (Regulatory Position C.1) and RG 8.10 (Regulatory Position C.1) and NUREG-1736, as it relates to maintaining doses ALARA.

According to BLN FSAR Appendix 12AA, NEI 07-03, NEI 07-08, and Chapter 13, "Conduct of Operations," specific individual(s) will be designated and assigned responsibility and authority for implementing ALARA policy at the BLN site. The Functional Manager in charge of Radiation Protection and the Radiation Protection staff periodically will review, update, and modify as appropriate, plant design features and changes, as well as all operating and maintenance features, using exposure data and experience gained from operating nuclear power plants to ensure that occupational exposures will be kept ALARA in accordance with RG 8.8 guidance.

Using the guidance of Section 12.1 of NUREG-0800, the staff finds BLN FSAR Section 12.1 and Appendix 12AA are in accordance with the ALARA provisions of 10 CFR 20.1101(b) and RG 8.8 (Regulatory Position C.2) and will include incorporation of measures for reducing the need for time spent in radiological areas; measures to control access to radiological areas; measures to reduce the production, distribution, and retention of activated corrosion products throughout the primary system; measures for assuring that ORE during decommissioning will be ALARA; reviews of design modifications by competent radiation protection personnel; instructions to engineers regarding ALARA design; experience from operating plants and past designs; and continuing facility design reviews.

Using the guidance of Section 12.1 of NUREG-0800, the staff finds that BLN COL FSAR Section 12.1 and Appendix 12AA describe an acceptable program to develop plans and procedures in accordance with RGs 1.33, 1.8, 8.8, and 8.10 that can incorporate the experiences obtained from facility operation into facility and equipment design and operations planning and that will implement specific exposure control techniques.

Initially, it was not clear to the NRC staff when the appropriate ALARA program and planning procedures would be implemented as described in the proposed License Conditions (Part 10 of the BLN, Units 3 and 4 COL application). Therefore, the staff issued request for additional information (RAI) 12.1-1. In a letter dated September 22, 2008, the applicant stated that ALARA focused procedures are developed in conjunction with the Radiation Protection Program (RPP) and thus will follow the RPP milestones for implementation found in FSAR Table 13.4-201. The applicant stated that FSAR Section 12.1, STD COL 12.1-1 text will be updated as to its commitment to the final ALARA program implementation. The NRC staff finds the RAI response acceptable because it clearly identified that ALARA practices will be in place at the same time as the RPP. The NRC staff verified that Revision 1 of the BLN COL FSAR adequately incorporates the above. As a result, RAI 12.1-1 is closed. For a discussion related to the proposed license condition related to the RPP, which includes ALARA practices, refer to SER Section 12.5.5.

In accordance with 10 CFR 20.1101(b), the staff finds that overall facility operations, as well as the RPP as described in BLN COL FSAR Section 12.5, Appendix 12AA, and NEI 07-03 will integrate the procedures necessary to ensure that radiation doses are ALARA, including work scheduling, work planning, design modifications, and radiological considerations. Operating and maintenance personnel will follow specific plans and procedures to ensure that

goals related to keeping exposures ALARA are achieved in the operation of the plant. Engineering controls for the protection of personnel will be optimized. Operations involving high person-sievert (person-rem) exposures will be carefully preplanned and carried out by personnel who are well trained in radiation protection and using proper equipment. During maintenance activities, in radiological areas, personnel will be monitored for exposure to radiation and contamination. Their radiation exposures will be reviewed and used to make changes in future job procedures and techniques.

The BLN FSAR states that COL information item, STD COL 12.1-1 is addressed in NEI 07-08, and Appendix 12AA of the BLN COL FSAR, which references NEI 07-03. The staff has reviewed the current version of NEI 07-03 and NEI 07-08 with respect to compliance with RG 1.8. The NEI 07-03 template states that the Radiation Protection Manager, Radiation Protection Technicians, and Radiation Protection Supervisory and Technical Staff will be trained and qualified in accordance with the guidance of RG 1.8. In a letter dated March 18, 2009 (ML090510379), the NRC accepted NEI 07-03, Revision 7. Specifically, the NRC staff indicated that for COL applications, NEI 07-03, Revision 7 provides an acceptable template for assuring that the RPP meets the applicable NRC regulations and guidance. Since the BLN COL FSAR has not yet adopted the approved version of the NEI template, this is identified as ***Confirmatory Item 12.1-1****. At present, the NRC has not accepted NEI-07-08 as an acceptable template to be used by the COL applicants. As a result, this is identified as* ***Open Item 12.1-1****.*

Supplemental Information

- *STD SUP 12.1-1*

The applicant added the following text to the end of Section 12.1.2.3, "Facility Layout General Design Considerations for ALARA," of the DCD included in the DC amendment:

> *A video record of the equipment layout in areas where radiation fields are expected to be high following operations may be used to assist in ALARA planning and to facilitate decommissioning.*

The NRC staff acknowledges STD SUP 12.1-1 as a statement of fact not requiring NRC review.

The following portion of this technical evaluation section is reproduced from Section 12.1.4 of the VEGP SER:

Resolution of Standard Content Open Item 12.1-1 and Confirmatory Item 12.1-1

The NRC staff compared the VEGP and BLN COL applications and found them to be essentially identical, with two exceptions: first, the application material under STD COL 12.1-1 in Section 12.1 of the VEGP application references NEI 07-08A and the application material under STD COL 12.1-1 in Section 12.1 of the BLN application references NEI 07-08, Revision 2; and second, the VEGP FSAR Appendix 12AA references NEI 07-03A and the BLN FSAR

Appendix 12AA references Revision 3 of NEI 07-03. Regarding these exceptions, the differing material associated with STD COL 12.1-1 in the VEGP FSAR is associated with adopting NEI 07-08A and NEI 07-03A, which are evaluated below as part of resolving Open Item 12.1-1 and Confirmatory Item 12.1-1.

In a letter from NEI to NRC dated October 29, 2009, NEI submitted NEI 07-08A to the NRC, which is the version of NEI 07-08 that has been accepted by the NRC. Accordingly, Open Item 12.1-1 is resolved for VEGP.

Confirmatory Item 12.1-1 is resolved for VEGP because the applicant has adopted the approved version of NEI 07-03 (i.e., NEI 07-03A, [see paragraph below]).

In Revision 2 of the VEGP COL FSAR, the applicant modified parts of FSAR Chapter 12, Appendix 12.AA that relate to STD COL 12.1-1. Specifically, in the FSAR, Revision 2, NEI 07-03A, is referenced. Accordingly, because NEI 07-03A is the approved version of NEI 07-03, the above conclusions regarding Confirmatory Item 12.1-1 are not affected by the changes to Revision 2 of the FSAR. One other change is the modification of a reference at the end of Appendix 12AA where the reference to RG 1.97 is changed from Revision 4 to Revision 3. The staff found the change acceptable, since Revision 3 provides for a more comprehensive version of the RG and also provides for portable radiation monitoring equipment. Revision 4 of RG 1.97 indicates that partial implementation is not recommended.

12.1.5 Post Combined License Activities

The post-COL activities related to ALARA practices (part of the RPP) are discussed in Section 12.5.5 of this SER.

12.1.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to ALARA, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable based on the relevant acceptance criteria provided in Section 12.1 of NUREG-0800. The staff based its conclusion on the following:

- STD COL 12.1-1, relating to ALARA and operational policies and compliance with relevant regulatory guidance, is acceptable because the applicant incorporates approved references NEI 07-03A and NEI 07-08A into the VCSNS COL FSAR and meets the applicable regulatory requirements and guidance specified in Sections 12.1.3 and 12.1.4 of this SER.

- STD SUP 12.1-1, relating to the use of video recording of equipment layout in areas where radiation fields are expected to be high, is acceptable because it is a statement of fact not requiring NRC approval.

12.2 Radiation Sources

12.2.1 Introduction

This section addresses the issues related to contained radiation sources and airborne radioactive material sources during normal operations, AOOs, and accident conditions affecting in-plant radiation protection.

12.2.2 Summary of Application

Section 12.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 12.2 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 12.2, the applicant provided the following:

AP1000 COL Information Item

- STD COL 12.2-1

The applicant provided additional information in STD COL 12.2-1 to resolve COL Information Item 12.2-1 (COL Action Item 12.3.1-1) which addresses miscellaneous sources.

12.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the radiation sources are given in Section 12.2 of NUREG-0800.

The applicable regulatory requirements for STD COL 12.2-1 are as follows:

- 10 CFR 20.1801, “Security of stored material”

- 10 CFR 20.1802, “Control of material not in storage”

- 10 CFR Part 50, “Domestic licensing of production and utilization facilities,” Appendix A, “General Design Criteria for Nuclear Power Plants,” GDC 61, “Fuel Storage and Handling and Radioactivity Control”

12.2.4 Technical Evaluation

The NRC staff reviewed Section 12.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff’s review confirmed that the information in the application and incorporated by reference addresses the required

information relating to radiation sources. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 12.2.4 of the VEGP SER:

> *The following portion of this technical evaluation section is reproduced from Section 12.2.4 of the BLN SER:*
>
> *AP1000 COL Information Item*
>
> - *STD COL 12.2-1*
>
> *The applicant provided additional information in STD COL 12.2-1, related to miscellaneous sources, to resolve COL Information Item 12.2-1. COL Information Item 12.1-1 states:*
>
> > *The Combined License applicant will address any additional contained radiation sources not identified in subsection 12.2.1, including radiation sources used for instrument calibration or radiography.*
>
> *The same commitment was also captured as COL Action Item 12.3.1-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793).*

The applicant provided additional information in the BLN COL FSAR to address the plant STD COL 12.2-1 dealing with miscellaneous sources. The applicant stated that licensed sources containing byproduct, source and special nuclear material that warrant shielding consideration will meet the applicable requirements of 10 CFR Parts 20, 30, 31, 32, 33, 34, 40, 50 and 70. The applicant indicated that there are byproducts and source materials with known isotopes and activity manufactured for the purpose of measuring, checking, calibrating, or controlling processes quantitatively or qualitatively. Accordingly, written procedures will be established and implemented that address procurement, receipt, inventory, labeling, leak testing, surveillance, control, transfer, disposal, storage, issuance and use of these radioactive sources. Also, the applicant indicated that sources maintained on-site for instrument calibration purposes will be shielded while in storage to keep personnel exposure ALARA.

The regulatory requirements cited in the above paragraph address the requirements applicable to sources that would likely be used in conjunction with construction, preoperational, and initial testing. The applicant will implement the practices for radioactive material control as described in NEI 07-03, Section 12.5.4.10, "Radioactive Material Control." In a letter dated March 18, 2009 (ML090510379), the NRC accepted NEI 07-03, Revision 7. Specifically, the NRC staff indicated that for COL applications, NEI 07-03, Revision 7 provides an acceptable template for assuring that the RPP meets the applicable NRC regulations and guidance. Since the BLN FSAR has not adopted the approved version of the NEI template, this is identified as ***Confirmatory Item 12.1-1****.*

The staff concludes that the information provided by the applicant with respect to radiation sources is acceptable and meets the requirements of 10 CFR Sections 20.1801 and 20.1802 and GDC 61. This conclusion is based on the applicant's commitment to the NEI 07-03 administrative controls to meet the regulatory requirements. These controls apply to the additional contained radiation sources discussed in the COL item. The staff notes that its review did not encompass the entire set of regulatory requirements cited by the applicant (10 CFR Parts 20, 30, 31, 32, 33, 34, 40, 50 and 70), since the staff's review is focused on radiation protection requirements on sources used in conjunction with the RPP.

The following portion of this technical evaluation section is reproduced from Section 12.2.4 of the VEGP SER:

<u>Resolution of Standard Content Confirmatory Item 12.1-1</u>

The NRC staff compared the VEGP and BLN COL applications regarding STD COL 12.2-1, and found them to be essentially identical, with the exception that VEGP FSAR Appendix 12AA references NEI 07-03A, whereas, the BLN FSAR references NEI 07-03, Revision 3. As indicated in Section 12.1.4 above, Confirmatory Item 12.1-1, is resolved for VEGP because the applicant has adopted the approved version of NEI 07-03, which is now designated as NEI 07-03A.

12.2.5 Post Combined License Activities

There are no post-COL activities related to this section.

12.2.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to radiation sources, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Since Confirmatory Item 12.1-1 has been resolved, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable based on the relevant acceptance criteria provided in Section 12.2 of NUREG-0800. The staff based its conclusion on the following:

- STD COL 12.2-1, which addresses miscellaneous sources, is acceptable because the applicant has incorporated the approved reference NEI 07-03A into the VCSNS COL FSAR and meets the requirements of 10 CFR 20.1801, 10 CFR 20.1802, and GDC 61.

12.3 Radiation Protection Design Features

Section 12.3, "Radiation Protection Design Features" and the following Section 12.4, "Dose Assessment," are treated as separate sections in the SER (as well as in the AP1000 DCD). However, these two sections are listed as a single section, Section 12.3-12.4, "Radiation Protection Design Features," in NUREG-0800, with the material discussed under the section "Dose Assessment" included in a section at the end of Section 12.3.

12.3.1 Introduction

This section addresses the issues related to radiation protection equipment and design features used to ensure that occupational radiation exposures are ALARA. It takes into account design dose rates, AOOs, and accident conditions. These issues include the facility design features, shielding, ventilation, area radiation and airborne radioactivity monitoring instrumentation, and dose assessment.

12.3.2 Summary of Application

Section 12.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 12.3 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 12.3, the applicant provided the following:

Tier 2 Departure

- VCS DEP 18.8-1

The applicant described the following portion of the Tier 2 departure (DEP) from the AP1000 DCD related to the radiation design protection features. The applicant proposed

revising several DCD figures in Section 12.3 to reflect the relocation of the Operations Support Center (OSC). Other aspects of this Tier 2 departure are evaluated in Sections 12.5, 13.3, and 18.8 of this SER.

AP1000 COL Information Items

- STD COL 12.3-1

The applicant provided additional information in STD COL 12.3-1 to resolve COL Information Item 12.3-1 (COL Action Item 12.4.2-1), which addresses the administrative controls for use of the design features provided to control access to radiological restricted areas.

- STD COL 12.3-2

The applicant provided additional information in STD COL 12.3-2 to resolve COL Information Item 12.3-2 (COL Action Item 12.4.4-1), which addresses the criteria and methods for obtaining representative measurement of radiological conditions, including airborne radioactivity concentrations in work areas.

- STD COL 12.3-3

The applicant provided additional information in STD COL 12.3-3 to resolve COL Information Item 12.3-3, which addresses the groundwater monitoring program beyond the normal radioactive effluent monitoring program.

- STD COL 12.3-4

The applicant provided additional information in STD COL 12.3-4 to resolve COL Information Item 12.3-4, which addresses the program to ensure documentation of operational events deemed to be of interest for decommissioning.

Supplemental Information

- VCS SUP 11.2-1

In a letter dated July 8, 2010, the applicant provided supplemental information in VCSNS COL FSAR Section 11.2.1.2.4 describing the liquid radwaste system (WLS) discharge piping exiting the Radwaste Building and the wastewater system (WWS) blowdown line piping running to the Plant Outfall at Parr Reservoir.

12.3.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the radiation protection design features are given in Section 12.3 of NUREG-0800.

The applicable regulatory requirements and guidance for STD COL 12.3-1 are as follows:

- 10 CFR Part 20
- RG 1.8, Revision 3
- RG 8.9, “Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program,” Revision 1
- RG 8.38, “Control of Access to High and Very High Radiation Areas in Nuclear Power Plants,” Revision 1
- NUREG-1736

The applicable regulatory requirements and guidance for STD COL 12.3-2 are as follows:

- 10 CFR Part 19, “Notices, instructions and reports to workers: inspection and investigations”
- 10 CFR Part 20
- 10 CFR Part 50
- NUREG-0737, ”Clarification of TMI Action Plan Requirements,” Item III.D.3.3
- RG 1.8, Revision 3
- RG 8.2, “Guide for Administrative Practices in Radiation Monitoring”
- RG 8.8, Revision 3
- RG 8.10, Revision 1-R
- RG 1.21, “Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants,” Revision 1, Appendix A, “Measuring Radioactive Materials in Liquid and Gaseous Effluents and Solid Waste”
- RG 1.97, Revision 4

The applicable regulatory requirements and guidance for STD COL 12.3-3 and STD COL 12.3-4 are as follows:

- 10 CFR 20.1406, “Minimization of contamination”
- 10 CFR 50.75, “Reporting and recordkeeping for decommissioning planning”
- RG 4.21, “Minimization of Contamination and Radioactive Waste Generation: Life Cycle Planning”

12.3.4 Technical Evaluation

The NRC staff reviewed Section 12.3 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to radiation protection design features. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff's review of this application included the following COL departure and information items:

- VCS DEP 18.8-1, Relocation of the Operations Support Center
- STD COL 12.3-1, Administrative Controls for Radiological Protection
- STD COL 12.3-2, Criteria and Methods for Radiological Protection
- STD COL 12.3-3, Groundwater Monitoring Program
- VCS SUP 11.2-1, Exterior Radwaste Discharge Piping
- STD COL 12.3-4, Record of Operational Events of Interest for Decommissioning

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application. Any confirmatory items in the standard content material retain the numbers assigned in the VEGP SER. Confirmatory items that are first identified in this SER section have a VCSNS designation (e.g., **VCSNS Confirmatory Item 12.3-1**).

Tier 2 Departure

- VCS DEP 18.8-1

The location of the VCSNS Units 2 and 3 OSC differs from the AP1000 DCD. The applicant's proposed revision to several DCD figures to reflect the relocation of the OSC is acceptable because the location of the OSC does not have an impact on the radiation protection design features.

The evaluation of the effect of the OSC relocation is addressed in SER Section 12.5 for the health physics (HP) facilities, in SER Section 13.3 for emergency preparedness, and in SER Section 18.8 for the human system interface design.

The following portion of this technical evaluation section is reproduced from Section 12.3.4 of the VEGP SER:

> *The following portion of this technical evaluation section is reproduced from Section 12.3.4 of the BLN SER:*
>
> *AP1000 COL Information Items*
>
> - *STD COL 12.3-1*
>
> *The applicant provided additional information in STD COL 12.3-1, related to the administrative controls for radiological protection, to resolve COL Information Item 12.3-1. COL Information Item 12.3-1 states:*
>
> > *The Combined License applicant will address the administrative controls for use of the design features provided to control access to radiologically restricted areas, including potentially very high radiation areas, such as the fuel transfer tube during refueling operations and to the reactor cavity.*
>
> *The commitment was also captured as COL Action Item 12.4.2-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:*
>
> > *The COL applicant will address the administrative controls for use of the design features provided to control access to radiologically restricted areas, including potentially very high radiation areas, such as the reactor cavity and the fuel transfer canal during refueling operations. The hatch to the spent fuel transfer canal will be treated as an entrance to a very high radiation area under 10 CFR Part 20 and will be locked during spent fuel transfer operations.*
>
> *The applicant addressed this STD COL item in BLN COL FSAR, Appendix 12AA. This appendix incorporates by reference NEI 07-03, Revision 7* [sic]. *The NEI template directs COL applicants to describe the site-specific plant information for areas requiring administrative controls for very high radiation areas. To supplement NEI 07-03, Section 12.5.4.4, "Access Control," the*

applicant provided additional measures in Appendix 12AA for access controls such as signs, locks, plant manager (or designee) approval for entry, and radiation protection personnel accompaniment and exposure control for entry into very high radiation areas. The applicant also stated that a closed circuit television system may be installed in high radiation areas to allow remote monitoring of individuals entering high radiation areas by personnel qualified in radiation protection procedures.

The COL applicant will apply the administrative controls for the use of the design features to control access to very high radiation areas, such as the fuel transfer tube during refueling and to the reactor cavity during operations, and other radiologically restricted areas to comply with 10 CFR Sections 20.1601 and 20.1602 The opening of the fuel transfer hatch is administratively controlled, treated as an entrance to a very high radiation area, and is in place during spent fuel transfer operation.

The staff finds the applicant's approach meets the requirements of 10 CFR Sections 20.1601 and 20.1602, and is consistent with RG 8.38, Regulatory Position C1 and C3, which will ensure that an individual is unable to gain unauthorized or inadvertent access to such areas.

In a letter dated March 18, 2009 (ML090510379), the NRC accepted NEI 07-03, Revision 7. Specifically, the NRC staff indicated that for COL applications, NEI 07-03, Revision 7 provides an acceptable template for assuring that the RPP meets the applicable NRC regulations and guidance. Since the BLN FSAR has not adopted the approved version of the NEI template, this is identified as ***Confirmatory Item 12.1-1****.*

The NRC staff reviewed STD COL 12.3-1 dealing with administrative controls for radiological protection, using the text added in Appendix 12AA. The BLN COL FSAR Appendix 12AA, incorporates by reference NEI 07-03.

In Appendix 12AA, the applicant has taken exception to NEI 07-03, Section 12.5 to not conform to the guidance of the following regulatory guides:

RG 8.20, "Applications for Bioassay for I-125 and I-131"
RG 8.26 [sic]*, "Bioassay at Uranium Mills"*
RG 8.32, "Criteria for Establishing a Tritium Bioassay Program"

The guidance documents were identified as outdated regulatory guidance in NUREG-1736, Consolidated Guidance: 10 CFR Part 20, "Standards for Protection Against Radiation," October 2001. NUREG-1736 describes that in conjunction with 10 CFR 20.1502(b), which requires licensees to monitor for likely intakes; 10 CFR 20.1204(a) and (b) prescribe how information obtained through monitoring is to be used when assessing exposures to workers from intakes. The NUREG recommends that licensees (and therefore applicants) consider the methods described in RG 8.9, "Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program," for estimating intakes of radionuclides and determining the frequency of bioassay measurements. RG 8.9 provides updated methods and guidance that was previously contained in

positions of the three RGs above. The applicant's commitment to RG 8.9 is sufficient to assure proper monitoring for intake of radionuclides.

In BLN COL FSAR, Appendix 12AA, the applicant took exception to the first paragraph of NEI 07-03, Section 12.5.2 to describe the equivalent key radiological protection positions for the BLN site. The description of organizational positions with specific radiation protection responsibilities is in BLN COL FSAR Section 13.1. BLN COL FSAR Section 13.1, "Organizational Structure of the Applicant," provides specific radiation protection responsibilities for key positions within the plant organization and the plant organization overall. Managers and supervisors within the plant operating organization are responsible for establishing goals and expectations for their organization and to reinforce behaviors that promote radiation protection. BLN COL FSAR Section 13.1.1, "Management and Technical Support Organization," and Section 13.1.2, "Operating Organization," provide the responsibilities of the organizations and positions to assure that radiological safety goals and expectations are adhered to.

The staff finds that the applicant's exception to NEI 07-03, Section 12.5.2 is acceptable because BLN COL FSAR Section 13.1 provides the key radiological safety responsibilities and organization consistent with RG 1.8.

The following portion of this technical evaluation section is reproduced from Section 12.3.4 of the VEGP SER:

<u>Correction of Errors in the Standard Content Evaluation Text</u>

The NRC staff identified an error in the text reproduced above from the BLN SER, Section 12.3.4, that requires correction. The BLN SER states that Appendix 12AA of the BLN COL FSAR incorporates by reference NEI 07-03, Revision 7. The appendix actually incorporates by reference NEI 07-03, Revision 3. The NRC staff also identified an error in the text reproduced above from the BLN SER, Section 12.3.4 regarding the reference to RG 8.22, which was incorrectly referred to as RG 8.26.

<u>Resolution of Standard Content Confirmatory Item 12.1-1</u>

The NRC staff compared the VEGP and BLN COL applications regarding STD COL 12.3-1, and found them to be essentially identical, with the exception that VEGP FSAR Appendix 12AA references NEI 07-03A and BLN FSAR Appendix 12AA references Revision 3 of NEI 07-03. Additional clarifying information has been added to the VEGP FSAR regarding STD COL 12.3-1, which is discussed below. As indicated in Section 12.1.4 above, Confirmatory Item 12.1-1, is resolved for VEGP because the applicant has adopted the approved version of NEI 07-03, which is now designated as NEI 07-03A.

In addition, changes have been made in Revision 2 of the VEGP FSAR Chapter 12 that relate to STD COL 12.3-1. The changes are as follows:

1. *A new Table 12AA-201 has been added to Appendix 12AA that provides information concerning access to very high radiation areas (VHRA). The*

table provides VHRA locations, DCD cross references, radiation sources in the locations and other conditions and restrictions.

2. *In FSAR Appendix 12AA, new text was added to Section 12.5.4.4 of NEI 07-03A. The text references new Table 12AA-201 and describes the information in it, discusses removal of the primary sources of radiation from the VHRA areas, and discusses verification walk downs of VHRA to ensure consistency with RG 8.38. In addition to the changes to Appendix 12AA discussed above, the applicant has also added text to Section 12.5.4 regarding the possible use of closed circuit television system to allow remote monitoring of individuals entering high radiation areas.*

These items (i.e., the addition of the table, reference to it and discussion of walk downs, and the closed circuit television system) are acceptable because they provide additional clarity and site-specific information regarding controls to VHRAs and more completely describe features that address STD COL 12.3-1.

The following portion of this technical evaluation section is reproduced from Section 12.3.4 of the BLN SER:

- *STD COL 12.3-2*

The applicant provided additional information in STD COL 12.3-2, related to the criteria and methods for radiological protection, to resolve COL Information Item 12.3-2. COL Information Item 12.3-2 states:

> *The Combined License applicant will address the criteria and methods for obtaining representative measurement of radiological conditions, including airborne radioactivity concentrations in work areas. The Combined License applicant will also address the use of portable instruments, and the associated training and procedures, to accurately determine the airborne iodine concentration in areas within the facility where plant personnel may be present during an accident.*

The same commitment was also captured as COL Action Item 12.4.4-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793).

The staff reviewed STD COL 12.3-2, dealing with criteria and methods for radiological protection. In BLN COL FSAR Section 12.3.4, the applicant presented the procedure detailing the criteria and methods for obtaining representative measurement of radiological conditions, including in-plant airborne radioactivity concentrations in accordance with applicable portions of 10 CFR Part 20 and consistent with the guidance in RGs 1.21, Appendix A, 8.2, 8.8, and 8.10.

The applicant also discussed the surveillance requirements and the frequency of scheduled surveillance that are consistent with the operational philosophy in RG 8.10. In Section 12.3.4, "Area Radiation and Airborne Radioactivity Monitoring Instrumentation," the applicant described the typical survey

frequencies and varieties of surveys. The surveys described in general terms include radiation, contamination, airborne radioactivity, and job coverage surveys for occupational radiation workers during normal and off-normal conditions.

Appendix 12AA also describes qualification and training criteria for site personnel consistent with the guidance in RG 1.8 and as described in FSAR Chapter 13. Section 13.2, "Training," incorporates NEI 06-13A, "Template for an Industry Training Program Description." NEI 06-13A, Section 1.2.7, provides training for the use of survey instruments, use of analytical equipment, radiation protection procedures and emergency plan procedures.

The applicant discussed a portable iodine monitoring system used to determine the airborne iodine concentration in areas where plant personnel may be present routinely and during an accident which meets the guidance of NUREG-0737, Item III.D.3.3 and complies with 10 CFR Part 50, Appendix A. The applicant will incorporate the use of this sampling system into the emergency plan implementing procedures.

The NRC staff reviewed BLN COL FSAR Section 12.3.4 and Appendix 12AA, dealing with standards applied to the calibration and maintenance of portable radiation survey instruments. The applicant describes Area and Airborne Radioactivity Monitoring Instrumentation in BLN COL FSAR Section 12.3.4 and also in Section 14.2.9.4.27, "Portable Personnel Monitors and Radiation Survey Instruments."

The portable personnel monitor and radiation survey instrument testing verifies that the devices operate in accordance with their intended function in support of the RPP as described in Chapter 12. The applicant stated as a prerequisite that the monitors, instruments and certified test sources are on site. The applicant also stated that the general test method and acceptance criteria for the monitors and instruments would be source checked and tested in accordance with the manufactures' recommendations. The NRC staff determined that additional information should be provided in addition to the use of manufacturers' recommendations. Additional standards such as American National Standards Institute (ANSI) N42.17A-1989, as it relates to the accuracy and overall performance of portable survey instruments, and ANSI N323A-1997, as it relates to the calibration and maintenance of portable radiation survey instruments should be provided. In response to RAI 12.3-12.4-5, in a letter from the applicant, dated September 22, 2008; the applicant stated that it intends to revise the BLN COL FSAR to include maintenance and calibration of survey instruments and to update the version of the ANSI standard in a future revision of the COL application. The NRC staff finds that Revision 1 of the BLN COL FSAR adequately addresses the above. As a result, RAI 12.3-12.4-5 is closed.

- *STD COL 12.3-3*

The applicant provided additional information in STD COL 12.3-3, related to the groundwater monitoring program, to resolve COL Information Item 12.3-3. COL Information Item 12.3-3 states:

> *The Combined License applicant will establish a groundwater monitoring program beyond the normal radioactive effluent monitoring program. If and as necessary to support this groundwater monitoring program, the Combined License applicant will install groundwater monitoring wells during the plant construction process. Areas of the site to be specifically considered in this groundwater monitoring program are as follows:*
>
> - *West of the auxiliary building in the area of the fuel transfer canal*
> - *West and south of the radwaste building*
> - *East of the auxiliary building rail bay and the radwaste building truck doors*

The applicant added text in BLN COL FSAR Appendix 12AA, Section 12AA.5.4.14 to the information incorporated from NEI 07-03 regarding the groundwater monitoring program.

The applicant stated that a groundwater monitoring program beyond the normal radioactive effluent monitoring program will be developed, if, and as necessary to support this groundwater monitoring program, design features will be installed during the plant construction process. The applicant discussed areas of the site to be specifically considered in this groundwater monitoring program.

The NRC staff evaluated the applicant's groundwater monitoring program to the criteria in 10 CFR 20.1406. 10 CFR 20.1406 requires the applicant to provide a description of how facility design and procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment; facilitate eventual decommissioning; and minimize, to the extent practicable, the generation of radioactive waste. The regulatory guidance which describes an acceptable method for meeting the regulation was published in June 2008, RG 4.21, Revision 0, "Minimization of Contamination and Radioactive Waste Generation: Life Cycle Planning."

The groundwater monitoring program as described in BLN COL FSAR Appendix 12AA included some implementation considerations, but the program lacked a description of the key components of the program such as, types and periodicity of routine samples, threshold activity to be detected, actions to be taken upon detection, and quality assurance practices to be used to ensure reasonable assurance of prompt identification of leakage into the groundwater (RAI 12.3-12.4-1 and RAI 12.3-12.4-2).

The applicant stated in a letter dated September 22, 2008, that it will adopt the NEI 08-08, "Generic FSAR Template Guidance for Life Cycle Minimization of

Contamination," Revision 0 template. If approved by the NRC, the applicant will provide additional description of site specific design features and procedures for operation that minimize contamination of the facility, site, and environment. NEI 08-08 is currently under staff review. This is identified as ***Open Item 12.3-1****.*

As described in Section 11.2.1 2.4 [sic] of the AP1000 DCD, Revision 17, the exterior monitored liquid effluent discharge pipe is engineered to preclude leakage by either enclosure within a guard pipe and leakage monitoring, or is accessible for visual inspection in total from the Radwaste Building to the licensed release point for dilution and discharge. No valves, vacuum breakers, or other fittings are incorporated outside of buildings. In a supplemental response dated December 16, 2008, to RAI 12.3-12.4-1, the applicant provided a proposed revision to the BLN COL FSAR to describe the site-specific design of the external radioactive waste discharge line. The staff agrees with the applicant that the site-specific design will minimize the potential for undetected leakage from this discharge to the environment at a non-licensed release point, and complies with 10 CFR 20.1406. The proposed change to the BLN COL FSAR is acceptable subject to a formal revision to the BLN COL FSAR. Accordingly, this is identified as ***Confirmatory Item 12.3-1****.*

The following portion of this technical evaluation section is reproduced from Section 12.3.4 of the VEGP SER:

Resolution of Standard Content Open Item 12.3-1

Revision 2 of the FSAR references NEI 08-08A, which is the version of NEI 08-08 that has been accepted by NRC. Accordingly, Open Item 12.3-1 is resolved for VEGP.

Resolution of Standard Content Confirmatory Item 12.3-1

The NRC staff verified that Section 11.2.1.2.4 of the VEGP FSAR was updated to include the information identified in BLN Confirmatory Item 12.3-1; therefore, Confirmatory Item 12.3-1 is resolved for VEGP.

Evaluation of Site-Specific Information in Standard Content Evaluation (VCS SUP 11.2-1)

Although the VCSNS applicant endorsed the response to BLN RAI 12.3-12.4-1, the applicant did not initially provide a description of the site-specific design of the external radioactive waste discharge line in Section 11.2 of the VCSNS COL FSAR. In its letter dated July 8, 2010, the applicant provided supplemental information (VCS SUP 11.2-1) regarding the design of both the WLS discharge piping exiting the Radwaste Building and the WWS blowdown line piping running to the Plant Outfall at Parr Reservoir. In the supplemental information added at the end of Section 11.2.1.2.4, the applicant stated that the WLS discharge piping from the Units 2 and 3 Radwaste Building would be stainless steel, enclosed with a guard pipe, and monitored for leakage to comply with 10 CFR 20.1406. The WWS blowdown line to the Plant Outfall at Parr Reservoir would be buried, high density polyethylene single-walled pipe. The wastewater would gravity drain from the blowdown sump to the diffuser at the Plant Outfall, and there would be no valves, vacuum breakers, or pumps along the WWS blowdown line between the point where WLS connects and the Plant Outfall. The applicant would evaluate the need to monitor for leakage of the WWS blowdown line and implement this monitoring, if necessary, as part of the

Units 2 and 3 Groundwater Monitoring Program described in NEI 08-08A. RG 4.21 states that applicants should strive to minimize leaks and spills, provide containment in areas where such events might occur, and provide for detection that supports timely assessment and appropriate response. NEI 08-08A states that the COL applicant would establish an onsite ground water monitoring program to ensure timely detection of inadvertent radiological releases to the ground water. On the basis that VCS SUP 11.2-1 states that the applicant would utilize double-walled piping or piping having no valves or vacuum breakers for piping described as buried underground and will implement a ground water monitoring program for the WWS blowdown line piping running to the Plant Outfall at Parr Reservoir, the staff finds that the site-specific design will minimize the potential for undetected leakage from this discharge to the environment at a nonlicensed release point, and the information provided in VCS SUP 11.2-1 complies with the requirements of 10 CFR 20.1406 and is, therefore, acceptable. Until the applicant includes VCS SUP 11.2-1 in a future version of the FSAR, this will be tracked as **VCSNS Confirmatory Item 12.3-1**.

Resolution of VCSNS Confirmatory Item 12.3-1

VCSNS Confirmatory Item 12.3-1 is an applicant commitment to revise VCSNS COL FSAR Section 11.2.1.2.4 to include plant-specific details describing the discharge piping for liquid radwaste. The staff verified that Section 11.2.1.2.4 of the FSAR was appropriately updated. As a result, VCSNS Confirmatory Item 12.3-1 is closed.

The following portion of this technical evaluation section is reproduced from Section 12.3.4 of the VEGP SER:

> *The following portion of this technical evaluation section is reproduced from Section 12.3.4 of the BLN SER:*
>
> - *STD COL 12.3-4*
>
> *The applicant provided additional information in STD COL 12.3-4, related to the record of operational events of interest for decommissioning, to resolve COL Information Item 12.3-4. COL Information Item 12.3-4 states:*
>
> > *The Combined License applicant will establish a program to ensure documentation of operational events deemed to be of interest for decommissioning, beyond that required by 10 CFR 50.75. This or another program will include remediation of any leaks that have the potential to contaminate groundwater.*
>
> *The applicant added text in Appendix 12AA, Section 12AA.5.4.15 to the information incorporated from NEI 07-03 dealing with a record of operational events of interest for decommissioning. The applicant discussed procedures established to document the operational events that are deemed of interest for decommissioning, beyond that required by 10 CFR 50.75. These documented operational events assist in developing a historical assessment of the nuclear facilities, thereby reducing time, effort, and hazards to personnel during decommissioning planning. This documentation will include identification of the remediation of any leaks, which have the potential to contaminate groundwater. The procedures that govern retention of these records, and the records themselves, should specify the retention period required to assure availability*

when they may be required (e.g., life of facility plus 30 years). The NRC staff requested in RAI 12.3-12.4-3 that the applicant include the operational and design COL information items that fully meet the objectives of RG 4.21, Revision 0 and hence the requirements of 10 CFR 20.1406, 'Minimization of Contamination."

In response to the RAI, in a letter dated September 22, 2008, the applicant stated that it intended to adopt NEI 08-08. This document is intended to provide the description of additional site procedures for decommissioning records which will demonstrate compliance with 10 CFR 20.1406. This is identified as ***Open Item 12.3-1****.*

The following portion of this technical evaluation section is reproduced from Section 12.3.4 of the VEGP SER:

Resolution of Standard Content Open Item 12.3-1

Revision 2 of the FSAR references NEI 08-08A, which is the version of NEI 08-08 that has been accepted by NRC. Accordingly, Open Item 12.3-1 is resolved for VEGP.

12.3.5 Post Combined License Activities

The post-COL activities related to the RPP are discussed in SER Section 12.5.5.

12.3.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the radiation protection design features, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable based on the relevant acceptance criteria for radiation protection design features provided in Section 12.3 of NUREG-0800. The staff based its conclusion on the following:

- STD COL 12.3-1, which addresses the administrative controls for use of the design features provided to control access to radiological restricted areas, is acceptable because the applicant has incorporated the approved reference NEI 07-03A into the VCSNS COL FSAR and meets the applicable regulatory requirements and guidance specified in Sections 12.3.3 and 12.3.4 of this SER.

- STD COL 12.3-2, which addresses the criteria and methods for obtaining representative measurement of radiological conditions, including airborne radioactivity concentrations in work areas, is acceptable because the applicant has demonstrated compliance with the applicable regulatory requirements and guidance specified in Sections 12.3.3 and 12.3.4 of this SER.

- STD COL 12.3-3 and VCS SUP 11.2-1, which address the groundwater monitoring program beyond the normal radioactive effluent monitoring program, are acceptable because the applicant has demonstrated compliance with the applicable regulatory requirements and guidance specified in Sections 12.3.3 and 12.3.4 of this SER.

- STD COL 12.3-4, which addresses the program to ensure documentation of operational events deemed to be of interest for decommissioning, is acceptable because the applicant has incorporated the approved reference NEI 08-08A into the VCSNS COL FSAR and meets the applicable regulatory requirements and guidance specified in Sections 12.3.3 and 12.3.4 of this SER.

- VCS DEP 18.8-1, in which the applicant proposed to relocate the OSC from that described in the AP1000 DCD, Section 12.5.2.2, is acceptable from a radiation protection design features perspective. The location of the OSC does not have an impact on the radiation protection facilities design. The ALARA briefing room remains as stated in the DCD, so there is no impact on radiation protection facilities, programs or functions.

12.4 Dose Assessment

12.4.1 Introduction

This section addresses the issues related to estimating the annual personal doses associated with operation, normal maintenance, radwaste handling, refueling, ISI and special maintenance (e.g., maintenance that goes beyond routine scheduled maintenance, modification of equipment to upgrade the plant, and repairs to failed components), and construction.

12.4.2 Summary of Application

Section 12.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 12.4 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 12.4, the applicant provided the following:

Supplemental Information

- VCS SUP 12.4-1

The applicant provided supplemental information to address dose to construction workers by adding new sections after DCD Section 12.4.1.8.

- STD SUP 12.4-1

The applicant provided supplemental information regarding conduct of radiological surveys in unrestricted and controlled areas and for radioactive materials in effluents discharged to unrestricted and controlled areas.

12.4.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the dose assessment are given in Section 12.4 of NUREG-0800.

The applicable regulatory requirements for VCS SUP 12.4-1 and STD SUP 12.4-1 are as follows:

- 10 CFR 20.1101
- 10 CFR 20.1301, "Dose limits for individual members of the public"
- 10 CFR 20.1302, "Compliance with dose limits for individual members of the public"

12.4.4 Technical Evaluation

The NRC staff reviewed Section 12.4 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to dose assessment. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting.

Supplemental Information

- VCS SUP 12.4-1

The applicant provided supplemental information regarding dose to construction workers in VCSNS COL FSAR Section 12.4.1.9 (Sections 12.4.1.9.1 through 12.4.1.9.6), "Dose to Construction Workers." Section 12.4.1.9.1 describes the site layout as depicted in Figure 2.1-203 of the VCSNS COL FSAR. The sources of radiation exposure to the construction workers are described in Section 12.4.1.9.2. Section 12.4.1.9.3 includes the assumptions and bases used to calculate the annual construction worker exposure estimates. In Section 12.4.1.9.4, the applicant identifies that construction workers are classified as members of the public and the regulatory requirements that are applicable to their exposures. This section also refers to Table 12.4-201, which includes the results of the exposures assessment and compares them to the applicable limits. Section 12.4.1.9.5 identifies the collective annual exposure estimate for all workers. Section 12.4.1.9.6 identifies that operating unit personnel will conduct radiological surveys in the unrestricted and controlled areas for demonstrating compliance with the dose limits of 10 CFR 20.1301 for construction workers. The supplemental information associated with Section 12.4.1.9.6 is evaluated in this SER section as STD SUP 12.4-1.

In VCSNS COL FSAR, Section 12.4.1.9.2, "Radiation Sources," identifies the sources of radiation that would be encountered by construction workers. Units 2 and 3 construction workers would be exposed to direct radiation and gaseous effluents from the existing Unit 1 operation. Unit 3 construction workers would also be exposed to direct radiation and gaseous effluents from Unit 2 once it would become operational. The applicant stated that direct radiation from the current operating unit and the onsite old steam generator recycling facility, based on operational environmental thermoluminescent dosimeter (TLD) measurements, is negligible. For conservatism, however, the applicant assumed the direct radiation exposure to Unit 2 and Unit 3 construction workers from Unit 1 operations would be 1 millirem (mrem) per year.

For the liquid exposure pathway, the applicant assumed construction workers would receive the same dose as the maximally exposed member of the public. In RAI 12.3-12.4-2, the staff requested additional information concerning the exposure to construction workers from liquid effluents, in particular for connecting the Units 2 and 3 liquid waste effluent discharge piping. In its response dated February 18, 2009, the applicant committed to make a future revision to the FSAR that clarified that this activity would be performed by trained radiation workers and is not considered a construction worker dose. This wording was incorporated into the VCSNS COL FSAR; as a result, RAI 12.3-12.4-2 is considered closed.

Based on analysis described in AP1000 DCD Section 12.4.2, the applicant stated that direct exposure to Unit 3 construction workers from Unit 2 operations would be negligible. However, for conservatism, the applicant has assumed the direct radiation exposure to Unit 3 construction workers from Unit 2 operations would be 1 mrem per year.

South Carolina Electric and Gas (SCE&G) COL, Part 3, Environmental Report, Section 4.5.2.1 briefly discusses the construction and operation of a planned independent spent fuel storage installation (ISFSI). VCSNS COL FSAR Section 12.4.1.9.2 does not mention this facility or the potential direct dose consequences to construction workers. The staff issued RAI 12.3-12.4-1 to request further information regarding a proposed ISFSI. In its response dated February 18, 2009, the applicant stated that the ISFSI would not begin operation to receive

Unit 1 spent nuclear fuel until nearly all the construction activity has ceased. The applicant also stated that a design for the ISFSI does not exist at this time and that no licensing actions have been initiated. The applicant further stated that when the ISFSI is licensed, its impact on the site would be evaluated under the applicable regulations.

The applicant stated that Unit 2 and Unit 3 construction workers would be exposed to routine gaseous effluents from Unit 1. Unit 3 construction workers also would be exposed to gaseous effluents from Unit 2 based on the effluent source term listed in AP1000 DCD, Table 11.3-3.

In RAI 12.3-12.4-3, the staff requested additional information about the construction worker doses as a result of Unit 1 gaseous effluents, specifically:

a. Actual location (along with basis) and dispersion parameters assumed for the maximum exposed Units 2 and 3 construction workers relative to the Unit 1 release points.

b. Justification for the use of what appears to be a single year of Unit 1 effluent data for the construction worker dose assessment.

Also in RAI 12.3-12.4-3, the staff requested additional information about the construction worker doses as a result of Unit 2 gaseous effluents, specifically:

a. Actual location (along with basis) and dispersion parameters assumed for the maximum exposed Unit 3 construction worker relative to the Unit 2 release points.

b. Rationale why 2,000 hours per year exposure represents the maximum exposure time, considering likely overtime during major construction activities.

In the applicant's response dated January 6, 2010, and then in a revised response dated April 27, 2010, the applicant stated that the construction worker gaseous effluent dose from Unit 1 was determined by reviewing the Unit 1 VCSNS – Annual Effluent Radioactive Release Reports for 2003 through 2007. The applicant stated that, based on the reported information for the maximally exposed individual (MEI) in an unrestricted area, a total effective dose equivalent (TEDE) dose rate of 1.2 mrem/year was assumed. Since the construction area for Units 2 and 3 is farther away than the nearest unrestricted area of Unit 1, this approach is conservative. By applying an occupancy factor of 2,000 hours per year, the applicant estimated the construction worker dose from Unit 1 gaseous effluents to be 0.27 mrem per year. The applicant stated that reviewing five years of release data ensures that the data is representative of actual plant operating conditions.

The applicant's RAI response also provided the distance, direction, and dispersion parameters used to calculate the Unit 3 construction worker exposure due to Unit 2 gaseous effluents. Using these assumptions, the applicant determined that Unit 3 construction worker exposure is 0.48 mrem per year from Unit 2 gaseous effluents. The applicant stated that workers were assumed to be onsite for 2,000 hours per year, to be consistent with assumptions that were used to determine the peak total number of construction workers (3,600) that will be on site. The applicant stated that given the calculated construction worker exposures in VCSNS COL FSAR Table 12.4-201, approximately 150,000 hours of overtime would be required before a construction worker would exceed the exposure limits of 10 CFR 20.1301. The applicant also stated that a paragraph would be added to the end of VCSNS COL FSAR Section 12.4.1.9.3 in

a future revision that summarizes the Unit 3 construction worker exposures from direct radiation, gaseous effluents, and liquid effluents from both Unit 1 and Unit 2.

In VCSNS COL FSAR Section 12.4.1.9.3, "Construction Worker Dose Estimates," the applicant identified the methodology used for the construction worker dose estimate as a result of Unit 1 and Unit 2 liquid and gaseous effluents. This section also provides information on the computer codes used, pathways considered, and the exposure times and number of personnel that were used in the assessment. The construction worker dose from liquid effluents is assumed to be equal to the calculated liquid effluent dose in accordance with the Offsite Dose Calculation Manual (ODCM) for Unit 1 and is based on predicted releases and transport pathways for Unit 2. For airborne doses, the applicant provided the computer codes and assumptions used for calculating construction worker doses.

In VCSNS COL FSAR Section 12.4.1.9.4, "Compliance with Dose Regulations," the applicant stated that the construction workers are members of the public and meet the requirements of 10 CFR 20.1301 and 10 CFR 20.1302. The applicant stated that the construction worker dose estimate is 1.3 mrem TEDE per year, which is less than the limits specified for members of the public. This section also refers to Table 12.4-201, where the results of the dose assessments are presented and compared to the applicable regulatory limits. In Table 12.4-201, the applicant stated that the total construction worker dose is 1.3 mrem/year, or 6.5E-04 mrem/hr.

In VCSNS COL FSAR Section 12.4.1.9.5, "Collective Doses to VCSNS Units 2 and 3 Workers," the applicant calculated that the collective dose for all construction workers is 4.6 person-rem. In conclusion, the applicant stated in VCSNS COL FSAR Section 12.4.1.9.6, "Operating Unit Radiological Surveys," that the operating unit would perform the radiological surveys in both controlled and unrestricted areas. These surveys will demonstrate compliance with dose limits for construction workers.

The staff evaluated the information and the dose analysis presented by the applicant in VCSNS COL FSAR Section 12.4, including the responses to RAIs 12.3-12.4-1, 12.3-12.4-2, and 12.3-12.4-3. The staff agrees that the construction workers would be exposed to direct and gaseous radiation sources from Unit 1 and also from Unit 2 when it becomes operational. The staff agrees that the direct radiation exposure to construction workers from Unit 1 is negligible, based on operational TLD measurements and the distance between Unit 1 and the construction site. The staff agrees that the information provided in the DCD supports the position that the direct radiation exposure to Unit 3 construction workers from Unit 2 is negligible.

In RAI 12.3-12.4-1, the staff requested further information regarding a proposed ISFSI. In its response, the applicant stated that the ISFSI would not begin operation to receive Unit 1 spent nuclear fuel until nearly all the construction activity has ceased; a design for the ISFSI does not exist at this time; and no licensing actions have been initiated. The applicant further stated that when the ISFSI is licensed, its impact on the site would be evaluated under the applicable regulations. The NRC agrees that an assessment of any potential exposure from a future planned ISFSI that applies to Unit 2 and Unit 3 construction workers would be performed during the licensing process for such a facility. Therefore, any further assessment at this time is not required.

The staff evaluated potential exposure to construction workers from gaseous effluents as presented in VCSNS COL FSAR Sections 12.4.1.9.2 and 12.4.1.9.3, as well as in the response to RAI 12.3-12.4-3. The applicant assumed that the construction worker gaseous effluent exposure is equal to the MEI offsite as reported in the Unit 1 ODCM. The gaseous effluent

exposure at a location is dependent on the distance, direction, and dispersion parameters at that specific point. The MEI offsite, even though it may be located nearer to the release point than the construction workers, is not necessarily a conservative approximation of the construction worker dose. As a result, the staff performed an independent assessment of the construction worker exposure resulting from the Unit 1 gaseous effluent releases. The result of the staff's evaluation supported the applicant's conclusion regarding its conservative assessment of the construction worker dose from Unit 1 gaseous effluents.

Using the location and dispersion parameters provided by the applicant in RAI 12.3-12.4-3, the staff performed an independent assessment of the construction worker exposure from Unit 2 gaseous effluents. The results of the staff's evaluation were in general agreement with the applicant's results for construction worker exposure from gaseous effluents from Unit 2. The applicant's basis for assuming a 2,000 work hour-year is acceptable to the staff because the RAI response demonstrated that even with extensive overtime, the construction worker radiation exposure will not approach the regulatory limits. In its response to this RAI, the applicant committed to make changes addressing its revised construction worker exposure in a future revision to Section 12.4.1.9.3 of the VCSNS COL FSAR. This is being tracked as **VCSNS Confirmatory Item 12.4-1**.

The staff has evaluated potential exposure to construction workers from liquid effluents as presented in VCSNS COL FSAR Section 12.4.1.9.3. The applicant did not state what the potable water source for the construction workers would be; however, according to VCSNS COL Environmental Report, Section 2.3.2.2.2, potable water is provided to the site via the Monticello Reservoir. The applicant assumed that the construction worker exposure is equal to the exposure received by the maximally exposed member of the public offsite; however, the staff recognized that while apparently seeming conservative, this assumption is not equivalent to exposure received by onsite construction workers. As a result, the staff has evaluated the potential construction worker exposure from liquid effluents released from the operation of Unit 1 and Unit 2. The results of the staff's evaluations are in general agreement with the applicant's conservative assumption regarding construction worker exposures to liquid effluents as reflected in the dose summaries included in the applicant's April 27, 2010, response to RAI 12.3-12.4-3.

In summary, the staff independently evaluated the construction worker doses and determined the applicant's assessment as listed in VCSNS COL FSAR Table 12.4-201 is reasonable. The NRC staff determined that the information provided in VCS SUP 12.4-1, regarding dose to construction workers, in the new Section 12.4.1.9, is acceptable. In accordance with the discussion in the above paragraphs, RAI 12.3-12.4-1 and RAI 12.3-12.4-2 are closed.

Resolution of VCSNS Confirmatory Item 12.4-1

VCSNS Confirmatory Item 12.4-1 is a commitment by the applicant to revise FSAR Sections 12.4.1.9.2 and 12.4.1.9.3 to provide information regarding the methodology used to estimate construction worker dose. The staff verified that the VCSNS COL FSAR was appropriately revised. Accordingly, VCSNS Confirmatory Item 12.4-1 is now closed.

The following portion of this technical evaluation section is reproduced from Section 12.4.4 of the VEGP SER:

- *STD SUP 12.4-1*

The following portion of this technical evaluation section is reproduced from Section 12.4.4 of the BLN SER:

- *BLN SUP 12.4-1*

The applicant provided supplemental information regarding the dose to construction workers in the BLN COL FSAR. In this section, the applicant evaluated the potential radiological dose impacts to construction workers at the BLN, Units 3 and 4 resulting from the operation of Unit 3. Since a portion of the Unit 4 construction period overlaps operation of Unit 3, construction workers at Unit 4 would be exposed to direct radiation and gaseous radioactive effluents from Unit 3. Doses to construction workers during construction of Unit 3 are not evaluated since the only radiation sources prior to the start-up of Unit 3 are background sources. The applicant discussed, as part of the dose assessment, the site layout, radiation sources, construction worker dose estimates, compliance with dose regulations, and collective doses to Unit 4 workers.

The NRC staff reviewed BLN SUP 12.4-1, regarding dose to construction workers. The information provided in FSAR Sections 12.4.1.9 was not sufficient for the staff to validate and verify the estimated doses for Unit 4 construction workers. Without this information the staff could not verify that the applicant met the acceptance criteria in Section 12.3-12-4 of NUREG-0800 and complied with the dose limits in 10 CFR 20.1301 and 10 CFR 20.1302. The information provided should include the information necessary to reproduce the calculations or reference where the information was obtained and is available to the staff (RAI 12.3-12.4-4). In response to the RAI, in a letter dated September 22, 2008, the applicant provided additional information such that an independent assessment of the major aspects of the construction worker dose assessment could be conducted. The applicant provided the information and assumptions necessary to perform a GASPAR II calculation for the construction worker dose when Unit 4 is under construction. The estimated maximum dose that is accessible to a construction worker is 0.071 mSv (7.1 mrem) per year. Collective dose to Unit 4 construction workers is estimated to be 0.0113 person-Sieverts (1.13 person-rem). BLN COL FSAR Section 12.4.1.9 and Table 12.4-201 documented compliance with 10 CFR 20.1301 and 10 CFR 20.1302. The staff's independent assessment based on the additional information provided by the applicant confirmed the BLN results. There is no BLN COL FSAR revision necessary. As a result, RAI 12.3-12.4-4 is closed.

Section 4.5 of Part 3, Environmental Report (ER), of the BLN COL application provides an analysis of the expected average annual dose that will be received by a construction worker at BLN Unit 4 during the construction period. Section 4.5.6 of the ER states that there will be a radiation protection and ALARA program for BLN Unit 4 construction workers that will meet the requirements of 10 CFR 20.1302. Section 4.6 of the ER Table 4.6-1 describes specific measures and controls. Contrary to the ER, BLN COL FSAR Section 12.4 does not contain

any description of a construction worker program to address minimizing exposure during BLN Unit 4 construction. In RAI 12.3-12.4-6, the applicant was requested to describe the program that will ensure the construction workers will be monitored and that exposures will be minimized and maintained ALARA in accordance with 10 CFR 20.1101(b). This is identified as ***Open Item 12.4-1****.*

Resolution of Open Item 12.4-1

In a letter dated July 16, 2009, the applicant proposed to add supplemental information to Section 12.4.1.9.5 of the VEGP COL FSAR regarding conduct of radiological surveys in unrestricted and controlled areas and for radioactive materials in effluents discharged to unrestricted and controlled areas. The supplemental text states that these surveys are conducted by the operating unit for the purposes of implementing 10 CFR 20.1302 and to demonstrate compliance with the standards of 10 CFR 20.1301 for construction workers. This text is acceptable because it is consistent with applicable regulatory requirements. The staff confirmed that the VEGP COL FSAR was appropriately revised, and Open Item 12.4-1 is, therefore, closed.

12.4.5 Post Combined License Activities

There are no post-COL activities related to this section.

12.4.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to dose assessment, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable based on the relevant acceptance criteria provided in Section 12.3-12.4 of NUREG-0800. The staff based its conclusion on the following:

- VCS SUP 12.4-1, which provides supplemental information to address dose to construction workers, is acceptable because the applicant has demonstrated compliance with applicable requirements of 10 CFR 20.1101; 10 CFR 20.1301; 10 CFR 20.1302; and the applicable acceptance criteria provided in NUREG-0800, Section 12.3-12.4.

- STD SUP 12.4-1, which provides supplemental information regarding conduct of radiological surveys in unrestricted and controlled areas and for radioactive materials in effluents discharged to unrestricted and controlled areas, is acceptable because the applicant has demonstrated compliance with applicable requirements of 10 CFR 20.1301 and 10 CFR 20.1302.

12.5 Health Physics Facilities Design (Related to RG 1.206, Section C.III.1, Chapter 12, C.I.12.5, "Operational Radiation Protection Program")

12.5.1 Introduction

This section addresses the objectives and design of the HP facilities. The HP facilities are designed with the objectives of:

- Providing capability for administrative control of the activities of plant personnel to limit personnel exposure to radiation and radioactive materials ALARA and within the requirements of 10 CFR Part 20.

- Providing capability for administrative control of effluent releases from the plant to maintain the releases ALARA and within the limits of 10 CFR Part 20 and the plant Technical Specifications.

12.5.2 Summary of Application

Section 12.5 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 12.5 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 12.5, the applicant provided the following:

Tier 2 Departure

- VCS DEP 18.8-1

The applicant described the following Tier 2 departure from the AP1000 DCD. The applicant proposed to revise AP1000 DCD Sections 12.5.2.2 and 12.5.3.2 to exclude the reference to the OSC.

AP1000 COL Information Item

- STD COL 12.5-1

The applicant provided additional information in STD COL 12.5-1 to resolve COL Information Item 12.5-1 (COL Action Item 12.6-1), which addresses the RPP description.

License Conditions

- Part 10, License Condition 3, Items C.1, D.2, G.4, and K.1

The actual milestones for the RPP are listed in Table 13.4-201.

- Part 10, License Condition 6, Operational Program Readiness

The applicant proposed a license condition to provide a schedule to support NRC inspection of operational programs including the RPP.

12.5.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the HP facilities design are given in Section 12.5 of NUREG-0800.

The applicable regulatory requirements and guidance for STD COL 12.5-1 are as follows:

- 10 CFR Part 20
- RG 8.2
- RG 8.4, "Direct Reading and Indirect Reading Pocket Dosimeters"
- RG 8.6, "Standard Test Procedures for Geiger-Muller Counters"
- RG 8.8, Revision 3
- RG 8.9, Revision 1
- RG 8.10, Revision 1-R
- RG 8.28, "Audible Alarm Dosimeters"
- NUREG-1736

The applicable regulatory requirement for License Condition 3, Items C.1, D.2, G.4, and K.1 is as follows:

- 10 CFR 20.1101

12.5.4 Technical Evaluation

The NRC staff reviewed Section 12.5 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the HP facilities design. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

Tier 2 Departure

- VCS DEP 18.8-1

Because the location of the VCSNS Units 2 and 3 OSC differs from the AP1000 DCD, the applicant proposes to eliminate the reference to the OSC center in the first sentence of AP1000 DCD, Section 12.5.2.2 and the last sentence of Section 12.5.3.2.

This departure is acceptable insofar as the HP facility design is concerned because the location of the OSC does not have an impact on the radiation protection facilities design. The ALARA briefing room remains as stated in the DCD, so there is no impact on radiation protection facilities, programs or functions.

The staff's evaluation of the effect of the OSC relocation on emergency preparedness is addressed in SER Section 13-3 and on the human system interface design is addressed in SER Section 18.8.

The following portion of this technical evaluation section is reproduced from Section 12.5.4 of the VEGP SER:

> *The following portion of this technical evaluation section is reproduced from Section 12.5.4 of the BLN SER:*
>
> *AP1000 COL Information Item*
>
> - *STD COL 12.5-1*
>
> *The applicant provided additional information in STD COL 12.5-1, addressing the RPP description, to resolve COL Information Item 12.5-1. COL Information Item 12.5-1 states:*
>
> > *The Combined License applicant will address the organization and procedures used for adequate radiological protection and to provide methods so that personnel radiation exposures will be maintained ALARA.*
>
> *The same commitment was also captured as COL Action Item 12.6-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793). The applicant stated that STD COL 12.5-1 is addressed in Appendix 12AA of the BLN COL FSAR. This appendix incorporates by reference NEI 07-03, Revision 3. The applicant described revisions to NEI 07-03 and supplemental information in Appendix 12AA of the BLN COL FSAR. The staff evaluated the revised text and supplemental information provided in conjunction with the referenced NEI 07-03,*

Revision 3 template. These revisions and supplements address STD COL Items 12.1-1, 12.3-1, 12.3-3, 12.3-4, and 12.5-1. The applicant's proposed revisions and supplements are:

1. *Specific organizational positions were described in Chapter 13 of BLN COL FSAR; and Sections 12.5.2.1 through 12.5.2.5 are not incorporated in Appendix 12AA.*

2. *Facilities, as described in general terms in NEI 07-03, Revision 3 are not incorporated in BLN COL FSAR Appendix 12AA; facilities, instrumentation, and equipment are described in DCD Section 12.5.2.*

3. *Supplemental information was provided for NEI 07-03, Section 12.5.3.3 to describe compliance with 10 CFR 20.1703(b) and 10 CFR 20.1705 when National Institute for Occupational Safety and Health (U.S. Public Health Service) tested and certified respiratory protection equipment is not used.*

4. *The following headings and associated material that are described in general terms in NEI 07-03, Revision 3 are not incorporated in Appendix 12AA. Radwaste Handling, Spent Fuel Handling, Normal Operation, and Sampling are described in DCD Section 12.5.3.*

5. *Supplemental information was provided for NEI 07-03, Section 12.5.4.4* [sic] *to describe the use of a closed circuit television system to allow remote monitoring for high radiation areas access.*

6. *Supplemental information was provided for NEI 07-03, Section 12.5.4.4 to describe access control measures for very high radiation areas. Locations and radiological controls of the radiation zones are described on plant diagrams in DCD Section 12.5.3.*

7. *Appendix 12AA revised NEI 07-03, Section 12.5.4.7 to clarify the location of the COL applicant's management policy, organizational responsibility authorities for implementing an effective ALARA program, and the establishment and implementation of radiation protection.*

8. *The applicant revised the second bullet of NEI 07-03, Section 12.5.4.7 II to require that the functional manager in charge of radiation protection be responsible for defining the value for "Significant exposures" and the associated activities within written procedures. The example value described in NEI 07-03 includes activities that are estimated to involve greater than 1 person-rem of collective dose.*

9. *The COL applicant added text after the last bullet of NEI 07-03, Section 12.5.4.8 to adopt NEI 08-08 that is currently under review by the NRC staff.*

10. *The COL applicant added information to NEI 07-03, Section 12AA.5.4.14 and Section 12AA.5.4.15* [sic] *to adopt NEI 08-08 that is currently under review by the NRC staff.*

The applicant describes the exceptions and supplemental information to NEI 07-03 that reference additional design and site-specific information necessary to clearly identify the source of the information addressed in the RPP as described in Appendix 12AA. The applicant's description provides sufficient detailed information supporting the exceptions or revisions such that the information described provides clear direction as to organizational structure, facilities, management policy for ALARA, and where the threshold for significant with exposures will be described. The NRC staff agrees that the applicant's exceptions to NEI 07-03, noted above are acceptable because these exceptions and the supplemental information satisfy the regulatory requirements of 10 CFR 20.1106 (b), the acceptance criteria of Sections 12.1 and 12.5 of NUREG-0800 and the regulatory guidance in RG 8.8, Position C.1.b, RG 8.9, and RG 8.10, Positions C.1.a, and C.2.

The applicant added Appendix 12AA, "Appendix 12AA, Radiation Protection Program Description," after Section 12.5 of the DCD. In this appendix the applicant incorporates by reference NEI 07-03, Revision 3. The applicant indicated that Table 13.4-201 provides milestones for radiation protection operational program implementation.

The NRC staff reviewed STD COL 12.5-1 dealing with the RPP description in BLN COL FSAR Appendix 12AA. The additional controls described in STD COL 12.5-1 are consistent with the discussion in NUREG-1736 regarding Bioassay programs for personnel monitoring and are consistent with the applicant's commitment to RG 8.9. The staff reviewed the threshold for determining significant exposures. The applicant stated that the functional manager in charge of radiation protection determines the threshold within procedures. Initially, the staff did not consider that the applicant exercised sufficient control related to maintaining ALARA (RAI 12.5-1).

In response to RAI 12.5-1, in a letter dated September 22, 2008, the applicant provided additional information that the final NEI 07-03 template (Revision 7) would be incorporated without departure concerning significant exposures. In a letter dated March 18, 2009 (ML090510379), the NRC accepted NEI 07-03, Revision 7. Specifically, the NRC staff indicated that for COL applications, NEI 07-03, Revision 7 provides an acceptable template for assuring that the RPP meets the applicable regulations and guidance. Since the BLN COL FSAR has not yet adopted the approved version of the NEI template, this is identified as ***Confirmatory Item 12.1-1****.*

The NRC staff reviewed Revision 0 of the BLN COL FSAR Appendix 1AA, which listed the applicant's conformance with radiation protection related RGs. The applicant stated that it will conform in general to RG 8.28, "Audible Alarm Dosimeters," Revision 0, dated August 1981, and specifically stated that it conforms to ANSI N13.7-1981, which was reaffirmed in 1992. ANSI N13.7-1983 is the "American National Standard for Radiation Protection-Photographic Film Dosimeters Criteria for Performance." RG 8.28, Revision 0, endorsed ANSI N13.27-1981, "Performance Specifications for Pocket-Sized Alarming Dosimeters/Ratemeters." This discrepancy was identified in RAI 1-10. In response to RAI 1-10, the applicant stated that BLN COL FSAR Appendix 1AA would be revised to the correct reference of the ANSI standard in a future

revision of the BLN COL FSAR. The NRC staff verified that Revision 1 of the BLN COL FSAR adequately addresses the proposed change. As a result, RAI 1-10 is closed.

The following portion of this technical evaluation section is reproduced from Section 12.5.4 of the VEGP SER:

The staff notes that the VEGP FSAR has not been updated to correct the discrepancy identified in RAI 1-10 regarding the reference to ANSI N13.27-1981. Revision 2 of the VEGP FSAR currently references the incorrect standard, ANSI N13.7-1981, under RG 8.28 in Appendix 1AA. Since the VEGP applicant has endorsed RAI 1-10, the staff expects this discrepancy to be corrected in a future revision of the VEGP FSAR. This is ***VEGP Confirmatory Item 12.5-2****.*

Correction of Error in the Standard Content Evaluation Text

The NRC staff identified two errors in the text reproduced above from the BLN SER, Section 12.5.4 that require correction. In the change numbered 5 above, the reference to "NEI 07-03, Section 12.5.4.4," is incorrect. The correct reference is to "NEI 07-03, Section 12.5.4.2." In the change numbered 10, above, the reference to "Section 12AA.5.4.14 and Section 12AA.5.4.15" is incorrect. The correct reference is to "Section 12.5.4.14 and Section 12.5.4.15."

Resolution of Standard Content Confirmatory Item 12.1-1

The NRC staff compared the VEGP and BLN COL applications regarding STD COL 12.5-1, and found them to be essentially identical, with the exception that VEGP FSAR Appendix 12AA references NEI 07-03A and BLN FSAR Appendix 12AA references Revision 3 of NEI 07-03. Additional clarifying information has been added to the VEGP FSAR regarding STD COL 12.5-1, which is discussed below. As indicated in Section 12.1.4 above, Confirmatory Item 12.1-1, is resolved for VEGP because the applicant has adopted the approved version of NEI 07-03, which is now designated as NEI 07-03A.

In Revision 2 of the FSAR, the applicant modified parts of FSAR Chapter 12, Appendix 12AA, that relate to STD COL 12.5-1. The changes are as follows:

1. *Text describing a closed circuit television system associated with high radiation areas has been moved from Appendix 12AA to Section 12.5.2.2 (this text is associated with STD COL 12.3-1, and is evaluated in Section 12.3.4 of this SER).*

2. *References in NEI 07-03A have been revised to reflect the appropriate sections of the FSAR.*

3. *Proposed modifications to the second bullet of NEI 07-03, Section 12.5.4.7 have been withdrawn.*

4. *Bullet number 3 of NEI 07-03A, Section 12.5, has been revised to address aspects of the radiation program functional areas that must be in place at various milestones.*

5. *A cross reference to NEI 08-08A has been added in NEI 07-03A.*

6. *The first paragraph of Section 12.5.4.12 of NEI 07-03A has been revised to address 10 CFR 20.1101 and the Quality Assurance Program.*

Items 1, 2, and 5 are acceptable because they are editorial and do not affect content. The change described in Item 3 is acceptable because NEI 07-03A is acceptable without modification. The changes described in Item 4 are acceptable because they are consistent with the milestones described in FSAR Table 13.4-201 and with applicable regulatory requirements. The changes described in Item 6 are acceptable because they are consistent with 10 CFR 20.1101 and the Quality Assurance Program described in FSAR Section 17.5.

Resolution of VEGP Confirmatory Item 12.5-2

Appendix 1AA of the VCSNS COL FSAR correctly references American National Standards Institute (ANSI) N13.27-1981 under the conformance discussion of RG 8.28. Therefore, VEGP Confirmatory Item 12.5-2 is resolved for the VCSNS COL application.

The following portion of this technical evaluation section is reproduced from Section 12.5.4 of the VEGP SER:

Exceptions to RGs 8.2, 8.4, 8.6, and Section C.3.b of RG 8.8

The following portion of this technical evaluation section is reproduced from Section 12.5.4 of the BLN SER.

The applicant took exception to RG 8.2, "Guide for Administrative Practices in Radiation Monitoring," regarding a reference to a previous version of 10 CFR Part 20 (10 CFR 20.401), because it is no longer valid. The staff agrees with the applicant's exception.

The applicant took exception to RG 8.4, "Direct Reading and Indirect Reading Pocket Dosimeters," regarding references to previous versions of 10 CFR Part 20 (10 CFR 20.202(a), and 10 CFR 20.401) because they are no longer valid. The staff agrees with the applicant's exception. The applicant also took exception to ANSI N13.5-1972 (R-1989), in that two performance criteria, accuracy and leakage, specified in the guidance, are to be met by acceptance standards in ANSI N322-1997, "ANSI Test, Construction, and Performance requirements for Direct Reading Electrostatic/Electroscope Type Dosimeters." The staff finds that by using ANSI N322-1997 for performance criteria, 10 CFR 20 requirements are still met, as the major change is the allowance of an additional one percent leakage over a comparable time period. Test and calibration intervals recommended by RG 8.4 are not affected.

The applicant took exception to RG 8.6, "Standard Test Procedures for Geiger Mueller Counters," to reference an instrument calibration program based upon ANSI Criteria N323A-1997 (with 2004 Correction Sheet), "Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments." This

methodology is acceptable over the previous program referenced in RG 8.6 because the ANSI standard reflects current industry practices. The staff agrees with the applicant's position.

The applicant took exception to part of Position C.3.b in RG 8.8, "Information Relevant to Ensuring that Occupational Radiation Exposure at Nuclear Power Stations will be ALARA." This exception was to the reporting requirements associated with operating exposure. The applicant's basis for justifying the exception to RG 8.8, Position C.3.b, is that reporting of operating exposure information is no longer required. The staff agrees with the applicant's exception to RG 8.8, Position C3.b, because this specific reporting requirement has been superseded. All licensees are now required to report records of ionizing exposure to the NRC annually in accordance with 10 CFR 20.2206.

<u>License Condition</u>

- *License Condition 3, Items C.1, D.2, G.4, and K.1*

Implementation milestones were provided by the applicant to address the RPP required by 10 CFR 20.1101. A phased-in implementation should include appropriate milestones in the construction of the facility. Staffing levels, equipment, facilities, and procedures necessary to ensure radiation safety of the workers and public for each phase of implementation should be identified. In RAI 12.5-2, the staff requested that the applicant provide the specific programs to be implemented at each milestone identified in Table 13.4-201 of the BLN COL FSAR. In its response to the RAI, the applicant provided clarifying information regarding Table 13.4-201.

In a supplemental response to RAI 12.5-2, dated December 16, 2008, the applicant provided a proposed revision to BLN COL FSAR Table 13.4-201 to show the specific program(s) for each milestone and assignment of a Radiation Protection Manager and Supervisor. The proposed change to BLN COL FSAR Table 13.4-201 is acceptable subject to a formal revision to the BLN COL FSAR, based on the specific commitment to establish an individual responsible for each milestone. Accordingly, this is identified as ***Confirmatory Item 12.5-1****.*

The following portion of this technical evaluation section is reproduced from Section 12.5.4 of the VEGP SER:

<u>Resolution of Standard Content Confirmatory Item 12.5-1</u>

The NRC staff verified that the VEGP FSAR was updated to include the information identified in the initial and supplemental BLN response to RAI 12.5-2. Accordingly, Standard Content Confirmatory Item 12.5-1 is resolved for the VEGP COL FSAR.

- *Part 10, License Condition 6, Operational Program Readiness*

The applicant proposed a license condition to provide a schedule to support NRC inspection of operational programs, including the RPP. The proposed license condition is consistent with the policy established in SECY-05-0197, "Review of

Operational Programs in a Combined License Application and General Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria," and is acceptable.

12.5.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff finds the following license conditions proposed by the applicant acceptable:

- License Condition (12-1) - The licensee shall implement the RPP including the ALARA principle (or applicable portions thereof) on or before the associated milestones identified below:

  – Receipt of Materials – Prior to initial receipt of byproduct, source, or special nuclear materials onsite (excluding exempt quantities as described in 10 CFR 30.18, "Exempt quantities")

  – Fuel Receipt – Prior to initial receipt of fuel onsite

  – Fuel Loading – Prior to initial fuel load

  – Waste Shipment – Prior to initial radioactive waste shipment

- License Condition (12-2) – No later than 12 months after issuance of the COL, the licensee shall submit to the Director of the Office of New Reactors (NRO) a schedule that supports planning for and conduct of NRC inspections of the operational program (RPP). The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until this operational program has been fully implemented.

12.5.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the radiation protection design features, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable based on the relevant acceptance criteria provided in Section 12.5 of NUREG-0800. The staff based its conclusion on the following:

- VCS DEP 18.8-1, in which the applicant proposed to relocate the OSC from that described in the AP1000 DCD, Section 12.5.2.2, is acceptable because the location of the OSC does not have an impact on the radiation protection facilities design. The ALARA briefing room remains as stated in the DCD, so there is no impact on radiation protection facilities, programs or functions.

- STD COL 12.5-1, which addresses the RPP description, is acceptable because the applicant has demonstrated compliance with the applicable regulatory requirements and guidance specified in Sections 12.5.3 and 12.5.4 of this SER.

13.0 CONDUCT OF OPERATIONS

13.1 Organizational Structure of Applicant

13.1.1 Introduction

The organizational structure includes the design, construction, and preoperational responsibilities of the organizational structure. The management and technical support organization includes a description of the corporate or home office organization, its functions and responsibilities, and the number and the qualifications of personnel. Its activities include facility design, design review, design approval, construction management, testing, and operation of the plant. The descriptions of the design and construction and preoperational responsibilities include the following:

- how these responsibilities are assigned by the headquarters staff and implemented within the organizational units
- the responsible working- or performance-level organizational unit
- the estimated number of persons to be assigned to each unit with responsibility for the project
- the general educational and experience requirements for identified positions or classes of positions
- early plans for providing technical support for the operation of the facility

This section also describes the structure, functions, and responsibilities of the onsite organization established to operate and maintain the plant.

13.1.2 Summary of Application

Section 13.1 of the V.C. Summer Nuclear Station (VCSNS) combined license (COL) Final Safety Analysis Report (FSAR), Revision 5, incorporates by reference Section 13.1 of the AP1000 Design Control Document (DCD), Revision 19.

In addition, in VCSNS COL FSAR Section 13.1, the applicant provided the following:

AP1000 COL Information Items

- VCS COL 13.1-1

The applicant provided additional information in VCS COL 13.1-1 to resolve COL Information Item 13.1-1 (COL Action Item 13.1-1). COL Information Item 13.1-1 requires the COL applicant to describe its organizational structure. VCS COL 13.1-1 describes organizational positions of the nuclear power station and owner/applicant corporations and associated functions and responsibilities.

- VCS COL 9.5-1

The applicant provided additional information in VCS COL 9.5-1, describing the fire protection program in Section 9.5.1.8. For this VCSNS COL item, the applicant added a new Section 13.1.1.2.10, "Fire Protection," and a new Section 13.1.1.3.2.1.4, "Engineer in Charge of Fire Protection." Table 1.8-202, "COL Item Tabulation," provides VCS COL 9.5-1 cross-references.

- VCS COL 18.6-1

The applicant provided additional information in VCS COL 18.6-1, describing the qualifications of the nuclear plant technical support personnel. VCS COL 18.6-1 is addressed under Section 13.1.1.4, "Qualifications of Technical Support Personnel," and Section 13.1.3.1, "Qualification Requirements." Table 1.8-202, "COL Item Tabulation," provides VCS COL 18.6-1 cross-references.

- VCS COL 18.10-1

The applicant provided additional information in VCS COL 18.10-1 to address the responsibilities of the manager in charge of nuclear training. VCS COL 18.10-1 is addressed in Section 13.1.1.3.2.2.1, "Functional Manager in Charge of Training (Nuclear Training)." Table 1.8-202, "COL Item Tabulation," provides VCS COL 18.10-1 cross-references.

13.1.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for VCS COL 13.1-1, VCS COL 9.5-1, VCS COL 18.6-1, and VCS COL 18.10-1 are given in Sections 13.1.1, "Management and Technical Support Organization," and 13.1.2-13.1.3, "Operating Organization," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)."

The applicable regulatory guidance for the organizational structure of the applicant is as follows:

- American National Standards Institute (ANSI)/American Nuclear Society (ANS)-3.1-1993, as endorsed and amended by Regulatory Guide (RG) 1.8, Revision 3, "Qualification and Training of Personnel for Nuclear Power Plants."

The applicable regulations and regulatory guidance for the management, technical support, and operating organizations of the applicant are as follows:

- Title 10 of the *Code of Federal Regulations* (10 CFR) 50.40, "Common standards"
- 10 CFR 50.54, "Conditions of licenses"
- RG 1.33, Revision 2, "Quality Assurance Program Requirements (Operation)"

13.1.4 Technical Evaluation

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed Section 13.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[13] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the organizational structure of the applicant. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

AP1000 COL Information Items

- VCS COL 13.1-1

The NRC staff reviewed VCS COL 13.1-1 related to the organizational structure of the COL applicant included under Section 13.1 of the VCSNS COL FSAR. Section 13.1 of the VCSNS COL FSAR describes the organizational positions of a nuclear power plant and owner/applicant corporations and associated functions and responsibilities.

The applicant provided the following additional VCSNS site-specific COL information to resolve COL Information Item 13.1-1, which addresses the organizational structure of the COL applicant. COL Information Item 13.1-1 states:

> Combined License applicants referencing the AP1000 certified design will address adequacy of the organizational structure.

The commitment was also captured as COL Action Item 13.1-1 in Appendix F of NUREG-1793, which states:

> The COL applicant will describe its organizational structure.

The applicant provided additional information as part of the VCSNS COL FSAR to describe the organizational positions of a nuclear power station and owner/applicant corporations and associated functions and responsibilities. The position titles used in the text are generic and describe the function of the position. The applicant stated that VCSNS COL FSAR Table 13.1-201, "Generic Position/Site-Specific Position Cross-Reference" provides a cross-reference to identify site-specific position titles.

The applicant added new sections and information related to the site-specific organizational structure to VCSNS COL FSAR Section 13.1 beyond the structure given in RG 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)." The new section titles are:

> 13.1.1, "Management and Technical Support Organization"
> 13.1.2, "Operating Organization"
> 13.1.3, "Qualifications of Nuclear Plant Personnel"

[13] See Section 1.2.2 for a discussion of the staff's review related to verification of the scope of information to be included in a COL application that references a design certification (DC).

Table 13.1-201, “Generic Position/Site-Specific Position Cross-Reference”
Table 13.1-202, “Minimum On-Duty Operations Shift Organization for Two-Unit Plant”

In addition, the applicant added a new appendix to Chapter 13 titled “Appendix 13AA Construction-Related Organization.” This appendix describes the applicant’s construction organization. Once plant operation commences, this appendix will become historical information.

The NRC staff has reviewed VCS COL 13.1-1 and concludes that the management, technical support, and operating organizations, as described, are acceptable and meet the requirements of 10 CFR 50.40(b) based on the following.

The applicant has described its organization for the management of, and its means of providing, technical support for the plant staff for the design, construction, and operation of the facility and has described its plans for managing the project and utilizing the nuclear steam system supplier (NSSS) vendor and architect-engineer (AE). These plans provide reasonable assurance that the applicant will establish an acceptable organization and that sufficient resources are available to provide offsite technical support and to satisfy the applicant's commitments for the design, construction, and operation of the facility.

The applicant has described the assignment of plant operating responsibilities; the reporting chain up through the chief executive officer; the functions and responsibilities of each major plant staff group; the proposed shift crew complement for single-unit or multiple-unit operation; the qualification requirements for members of its plant staff; and staff qualifications. In Table 1.9-202, “Conformance with SRP Acceptance Criteria,” of the VCSNS COL FSAR, the applicant noted an exception to the criteria of NUREG-0800, Section 13.1.2-13.1.3 that suggests resumes of personnel holding plant managerial and supervisory positions be included in the FSAR. The staff finds this exception to the criteria of NUREG-0800, Section 13.1.2-13.1.3 acceptable because resumes for management and principal supervisory and technical positions will be available for review after position vacancies are filled.

NUREG-0800, Section 13.1.2-13.1.3, “Operating Organization,” provides the following acceptable characteristics for an applicant's operating organization:

1. The applicant is technically qualified, as specified in 10 CFR 50.40(b).

2. An adequate number of licensed operators will be available at all required times to satisfy the minimum staffing requirements of 10 CFR 50.54(j).

3. On-shift personnel are able to provide initial facility response in the event of an emergency.

4. Organizational requirements for the plant manager and radiation protection manager have been satisfied.

5. Qualification requirements and qualifications of plant personnel conform to the guidance of RG 1.8.

6. Organizational requirements conform to the guidance of RG 1.33.

The NRC staff finds that the operating organization proposed by the applicant will comply with these characteristics. These findings contribute to the judgment that the applicant complies with the requirements of 10 CFR 50.40(b). That is, the applicant is technically qualified to engage in design and construction activities and to operate a nuclear power plant; that the applicant will have the necessary managerial and technical resources to support the plant staff in the event of an emergency; and that the applicant has identified the organizational positions responsible for fire protection matters and delegated the authorities to these positions to implement fire protection requirements.

- VCS COL 9.5-1

The applicant added text to VCSNS COL FSAR Section 13.1.1.2.10, "Fire Protection," indicating that the nuclear power station is committed to maintaining a fire protection program as described in VCSNS COL FSAR Section 9.5, and that the site vice president, through the engineer in charge of fire protection, is responsible for the fire protection program. The applicant added text to VCSNS COL FSAR Section 13.1.1.3.2.1.4, "Engineer in Charge of Fire Protection," describing the responsibilities of the engineer in charge of the fire protection program.

The NRC staff reviewed VCS COL 9.5-1 relative to the text added to Sections 13.1.1.2.10 and 13.1.1.3.2.1.4 of the VCSNS COL application. Based on the management descriptions provided in Sections 13.1.1.2.10 and 13.1.1.3.2.1.4, the staff finds the applicant's fire protection organization meets the guidance of NUREG-0800. The technical review for VCS COL 9.5-1 as it relates to the programmatic requirements is addressed in Section 9.5 of this safety evaluation report (SER).

- VCS COL 18.6-1

The NRC staff reviewed VCS COL 18.6-1, which describes the qualifications of the nuclear plant technical support personnel.

In Table 1.9-202, "Conformance with SRP Acceptance Criteria," of the VCSNS COL FSAR, the applicant noted an exception to the criteria of NUREG-0800, Section 13.1.1 that suggests the experience requirements of managers and supervisors of the technical support organization are included in the FSAR. The staff finds this exception to the criteria of NUREG-0800, Section 13.1.1 acceptable because the applicant added text to VCSNS COL FSAR Section 13.1.1.4, "Qualifications of Technical Support Personnel," stating the qualifications of managers and supervisors of the technical support organization will meet the education and experience requirements described in ANSI/ANS-3.1-1993 and RG 1.8.

The applicant added text to VCSNS COL FSAR Section 13.1.3, "Qualification Requirements," stating, in Section 13.1.3.1, the qualifications of managers, supervisors, operators, and technicians of the operating organization will meet the education and experience requirements described in ANSI/ANS-3.1-1993 and RG 1.8. In addition, Section 13.1.3.2 states that resumes and other documentation of the qualifications and experience of initial appointees to appropriate management and supervisory positions will be available for review after position vacancies are filled.

The applicant added VCSNS COL FSAR Table 13.1-202, "Minimum On-Duty Operations Shift Organization for Two-Unit Plant." Table 13.1-202 describes the minimum composition of the operating shift crew for all modes of operation. Position titles, license requirements and

minimum shift manning for the various modes of operation are addressed in Technical Specifications and will be addressed in administrative procedures.

The NRC staff reviewed the text added to VCSNS COL FSAR Sections 13.1.1.4 and 13.1.3.1 relative to VCS COL 18.6-1 and concludes that the qualification requirements are acceptable and meet the requirements of 10 CFR 50.40(b) based on the following.

The applicant has described its organization for the management of, and its means of providing, technical support for the plant staff for the design, construction, and operation of the facility and has described its plans for managing the project and utilizing the NSSS vendor and AE. These plans give reasonable assurance that the applicant will establish an acceptable organization and that sufficient resources are available to provide offsite technical support and to satisfy the applicant's commitments for the design, construction, and operation of the facility.

- VCS COL 18.10-1

The NRC staff reviewed VCS COL 18.10-1 included under Section 13.1.1.3.2.2.1, “Functional Manager in Charge of Training (Nuclear Training).” This section describes the responsibilities of the manager in charge of nuclear training relative to the site training programs required for the safe and proper operation and maintenance of the plant. This item is cross-referenced to VCSNS COL FSAR Section 18.10 in Table 1.8-202, “COL Item Tabulation.” The NRC staff concludes that the qualification requirements are acceptable and meet the requirements of 10 CFR 50.40(b) and the regulatory guidelines in NUREG-0800, Sections 13.1.1 and 13.1.2-13.1.3 because the applicant described how the training manager will carry out his or her position responsibilities for designing, developing, implementing, and maintaining training programs for the safe and proper operation and maintenance of the plant.

13.1.5 Post Combined License Activities

There are no post-COL activities related to this section.

13.1.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff’s review confirmed that the applicant addressed the required information relating to the organizational structure of the applicant, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff’s technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VCSNS COL FSAR is acceptable because it meets the acceptance criteria provided in NUREG-0800, Section 13.1. The staff based its conclusion on the following:

- VCS COL 13.1-1, related to the organizational structure of the COL applicant, is acceptable because it meets the requirements of 10 CFR 50.40(b).

- VCS COL 9.5-1, related to the fire protection organization meets the guidance of Section 13.1 of NUREG-0800 and is acceptable.

- VCS COL 18.6-1, related to the qualifications of nuclear plant technical support personnel, is acceptable because it meets the requirements of 10 CFR 50.40(b).

- VCS COL 18.10-1, related to the qualification requirements for the manager in charge of nuclear training, is acceptable because it meets the requirements of 10 CFR 50.40(b).

13.2 Training

13.2.1 Introduction

This section addresses the description and schedule of the training program for reactor operators (ROs) and senior reactor operators (SROs), i.e., licensed operators. It addresses the scope of licensing examinations as well as training requirements. The licensed operator training program also includes the requalification programs as required in 10 CFR 50.54(i)(i-1) and 10 CFR 55.59, "Requalification." In addition, this section of the VCSNS COL FSAR includes the description and schedule of the training program for non-licensed plant staff.

13.2.2 Summary of Application

Section 13.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 13.2 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 13.2, the applicant provides the following:

AP1000 COL Information Items

- STD COL 13.2-1

The applicant provided additional information in Standard (STD) COL 13.2-1 to resolve COL Information Item 13.2-1 (COL Action Item 13.2-1), which incorporates the provisions of Nuclear Energy Institute (NEI) 06-13A, "Template for an Industry Training Program Description," providing the description and scheduling of the training program for plant personnel, including the requalification program for licensed operators.

- STD COL 18.10-1

The applicant provided additional information in STD COL 18.10-1 to address training for those operators involved in the Human Factors Engineering (HFE) Verification and Validation Program, using a systematic approach to training and Westinghouse Commercial Atomic Power (WCAP)-14655, "Designer's Input to the Training of the Human Factors Engineering Verification and Validation Personnel."

License Conditions

- Part 10, License Condition 3, Items B.1, C.3

The applicant proposed a license condition in Part 10 of the VCSNS COL application, which provides the milestones for implementing the Reactor Operator Training (B.1) and the applicable portions of the Non-Licensed Plant Staff Training Program (C.3) (required in accordance with 10 CFR 50.120, "Training and qualification of nuclear power plant personnel").

The license condition related to the portions of the Non-Licensed Plant Staff Training Program applicable to radioactive material is addressed in Chapter 1 of this SER.

- Part 10, License Condition 6

The applicant proposed a license condition to provide a schedule to support the NRC's inspection of operational programs included in VCSNS COL FSAR Table 13.4-201, including the Non-Licensed Plant Staff Training Program, (required in accordance with 10 CFR 50.120), Reactor Operator Training Program, and the Reactor Operator Requalification Program.

13.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the description and schedule of the training program for licensed operators are given in Sections 13.2.1 and 13.2.2 and Chapter 18 of NUREG-0800.

The applicable regulations and regulatory guidance documents for STD COL 13.2-1 are as follows:

- 10 CFR 50.54(m)
- 10 CFR Part 55, "Operators' licenses"
- RG 1.8
- RG 1.149, "Nuclear Power Plant Simulation Facilities for Use in Operator Training and License Examinations"
- NUREG-1021, "Operator Licensing Examination Standards for Power Reactors"

The applicable regulations for the Non-Licensed Plant Staff Training Program are as follows:

- 10 CFR 50.120
- 10 CFR 52.79(a)(33), "Contents of applications; technical information"

The applicable regulations for the licensed operators training program are as follows:

- 10 CFR 55.13, "General exemptions"
- 10 CFR 55.31, "How to apply"
- 10 CFR 55.41, "Written examinations: Operators"
- 10 CFR 55.43, "Written examinations: Senior operators"
- 10 CFR 55.45, "Operating tests"

The applicable regulations for the licensed operator's requalification program are found in:

- 10 CFR 50.34(b), "Final safety analysis report"
- 10 CFR 50.54(i)
- 10 CFR 55.59, "Requalification"

The applicable regulatory guidance for STD COL 18.10-1 is as follows:

- NUREG-0711, "Human Factors Engineering Program Review Model"

13.2.4 Technical Evaluation

The NRC staff reviewed Section 13.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the description and schedule of the training programs for nuclear plant personnel. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (Vogtle Electric Generating Plant (VEGP), Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs).

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the Bellefonte Nuclear Plant (BLN) Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 13.2.4 of the VEGP SER:

AP1000 COL Information Items

- *STD COL 13.2-1*

The NRC staff reviewed STD COL 13.2-1 related to COL Information Item 13.2-1 (COL Action Item 13.2-1) included under Section 13.2 of the BLN COL FSAR. COL Information Item 13.2-1 states:

> *The Combined License applicants referencing the AP1000 certified design will develop and implement training programs for plant personnel. This includes the training program for the operations personnel who participate as subjects in the human factors engineering verification and validation. These Combined License applicant training programs will address the scope of licensing examinations as well as new training requirements.*

The commitment was also captured as COL Action Item 13.2-1 in Appendix F of the NRC staff FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will develop and implement training programs for plant personnel.*

The applicant provided the following text to supplement Section 13.2, "Training," of the AP1000 DCD, dealing with the training program for plant personnel.

> *This section incorporates by reference NEI 06-13* (sic) [NEI 06-13A]*, Template for an Industry Training Program Description. See Table 1.6-201.*

This technical report provides a complete training program description for use with COL applications. The staff has endorsed NEI 06-13A, Revision 1, as it provides an acceptable template for describing licensed operators and non-licensed plant staff training programs. The applicant has incorporated by reference NEI 06-13A, Revision 1.

The applicant provided the following text to supplement Section 13.2, "Training," of the AP1000 DCD, which is included in the [design certification] *DC amendment as part of the BLN COL FSAR to address STD COL 13.2-1, dealing with the training program for plant personnel.*

> *Table 13.4-201 provides milestones for training implementation.*

NUREG-0800, Section 13.2.1, establishes milestones for the licensed operators and non-licensed plant staff training programs and for the licensed operator requalification training program. The BLN COL FSAR has identified those milestones in Table 13.4-201. The staff determined that this is acceptable, as the milestone information included in this table meets the criteria found in NUREG-0800.

- *STD COL 18.10-1*

The NRC staff reviewed STD COL 18.10-1, related to COL Information Item 18.10-1 (COL Action Item 18.10.3-1). COL Information Item 18.10-1 states:

> *Combined License applicants referencing the AP1000 certified design will develop and implement training programs for plant personnel. This includes the training program for the operations personnel who participate as subjects in the human factors engineering verification and validation. These Combined License applicant training programs will address the scope of licensing examinations as well as new training requirements.*

The commitment was also captured as COL Action Item 18.10.3-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *With regard to the training program development, the COL applicant will: (1) address the training program development considerations in NUREG-0711, (2) address relevant concerns identified in this report* [NUREG-1793], *and (3) identify the minimum documentation that the COL applicant will provide to enable the staff to complete its review.*

This section refers to Sections 13.1, "Organizational Structure of Applicant" and 13.2, "Training" regarding the training program development.

The NRC staff reviewed the resolution to STD COL 18.10-1, related to staffing and qualifications included under Section 18.10 of the BLN COL FSAR. The applicant provided the referenced NRC-endorsed NEI 06-13A, Revision 1, to address COL Information Item 18.10-1.

NEI 06-13A, Revision 1 was written to provide COL applicants with a generic program description for use with COL application submittals. In a letter dated December 5, 2008, the staff stated that the training template of NEI 06-13A, Revision 1, was an acceptable means for describing licensed operator and non-licensed plant staff training programs. The staff finds the applicant's incorporation of NEI 06-13A, Revision 1 to be acceptable because it utilizes an NRC-endorsed methodology.

In Table 1.9-202, "Conformance with SRP Acceptance Criteria," of the BLN COL FSAR, the applicant identified two exceptions to the criteria of NUREG-0800, Section 13.2, which recommends following the guidance in NUREG-0711 and RG 1.149. Further, the applicant stated in Table 1.9-202 that NEI 06-13A is incorporated by reference into the BLN COL FSAR. The staff's safety evaluation report for NEI 06-13A (ML0709504790) states that NEI 06-13A complies with the guidance in NUREG-0711 and RG 1.149. Therefore, the staff finds the two exceptions to the criteria in NUREG-0800, Section 13.2 to be acceptable because NEI 06-13A complies with the guidance in NUREG-0711 and RG 1.149.

License Conditions

- *Part 10, License Condition 3, Item B1*

The NRC staff finds the implementation milestone for the Reactor Operator Training Program (18 months prior to schedule date of initial fuel load) to be acceptable because it is consistent with 10 CFR 50.120.

- *Part 10, License Condition 6*

The applicant proposed a license condition in Part 10 of the VEGP COL application to provide a schedule to support the NRC's inspection of operational programs, including the Non-Licensed Plant Staff Training Program, (required in accordance with 10 CFR 50.120), Reactor Operator Training Program, and Reactor Operation Requalification Program. The proposed license condition is consistent with the policy established in SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria," for operational programs in general, and is acceptable.

13.2.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff finds the following license conditions proposed by the applicant acceptable:

- License Condition (13-1) – The licensee shall implement the Reactor Operator Training Program at least 18 months prior to schedule date of initial fuel load.

- License Condition (13-2) – No later than 12 months after issuance of the COL, the licensee shall submit to the Director of the Office of New Reactors (NRO) a schedule that supports planning for and conduct of NRC inspection of the operational programs (the Non-Licensed Plant Staff Training Program (required in accordance with 10 CFR 50.120), Reactor Operator Training Program, and Reactor Operation Requalification Program). The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until these operational programs have been fully implemented.

13.2.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the description and schedule of the training program for licensed operators, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VCSNS COL FSAR is acceptable because it meets the acceptance criteria provided in NUREG-0800 Section 13.2. The staff based its conclusion on the following:

- STD COL 13.2-1 incorporates by reference NEI 06-13A, Revision 1, which provides an acceptable template for describing licensed operators and non-licensed plant staff training programs. The staff determined that this is acceptable, as it applies an NRC-endorsed approach.

- STD COL 18.10-1, relating to training, references Section 13.2 of the VCSNS COL FSAR, in which the applicant has committed to use WCAP-14655 to ensure a systematic approach to training development, and has referenced NEI 06-13A, Revision 1. The staff finds this acceptable because it applies an NRC-endorsed approach.

13.3 Emergency Planning

13.3.1 Introduction

This section addresses the plans, design features, facilities, functions, and equipment necessary for radiological emergency planning (EP) that must be considered in a COL application. This includes both the applicant's onsite emergency plan and State and local offsite emergency plans, which the NRC and the Federal Emergency Management Agency (FEMA) evaluated to determine whether the plans are adequate, and that there is a reasonable assurance that they can be implemented. The plans shall be an expression of the overall concept of operation, describe the essential elements of advanced planning that have been considered, and the provisions that have been made to cope with radiological emergency situations.

13.3.2 Summary of Application

Section 13.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 13.3 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 13.3, the applicant provided the following:

Tier 2 Departure

- VCS DEP 18.8-1

The applicant proposed this departure from the AP1000 DCD to address new locations of the technical support center (TSC) and the operational support center (OSC) for each unit. Part 7, "Departures and Exemptions," provides additional information regarding the departures.

AP1000 COL Information Items

- STD COL 13.3-1

The applicant provided additional information in STD COL 13.3-1 to address COL Information Item 13.3-1 (COL Action Item 13.3-1) of the AP1000 DCD, which states:

> Combined License applicants referencing the AP1000 certified design will address emergency planning including post-72 hour actions and its communication interface.

- STD COL 13.3-2

The applicant provided additional information in STD COL 13.3-2 to address COL Information Item 13.3-2 (COL Action Item 13.3.3.3.5-1) of the AP1000 DCD, which states:

> Combined License applicants referencing the AP1000 certified design will address the activation of the emergency operations facility consistent with current operating practice and NUREG-0654/FEMA-REP-1 ["Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants" Revision 1].

Supplemental Information

- STD SUP 13.3-1

The applicant provided additional information in STD SUP 13.3-1 that provides milestones for EP implementation.

Part 5, "Emergency Plan," Revision 5, of the VCSNS COL application includes the following:

Onsite Emergency Plans

Part 5, "Emergency Planning," of the VCSNS COL application includes the Emergency Plan (the VCSNS Emergency Plan). The VCSNS Emergency Plan consists of a basic plan, three annexes and six appendices. The three annexes address the one operating reactor unit and the two proposed units. The staff's evaluation in this SER is limited to Units 2 and 3. The six appendices provide additional detailed information regarding various aspects of the VCSNS Emergency Plan.

Offsite Emergency Plans

Part 5, "Emergency Planning," of the VCSNS COL application includes current State and local emergency plans. In addition, Part 5 includes the detailed evacuation time estimate (ETE) report.

ITAAC

Part 10, "Proposed License Conditions and ITAAC," Revision 5, of the VCSNS COL application provides information regarding emergency planning – inspections, tests, analyses and acceptance criteria (EP ITAAC). The ITAAC is evaluated in Section 13.3C.19 of this SER.

License Conditions

- Part 10, License Condition 1

The applicant proposed a license condition to incorporate the ITAAC identified in the tables in Appendix B to Part 10 of the VCSNS COL application.

- Part 10, License Condition 6

The applicant proposed a license condition to provide a schedule to support the NRC's inspection of operational programs including the EP.

- Part 10, License Condition 11

The applicant proposed the following license condition:

> The licensee shall submit a fully developed set of plant-specific Emergency Action Levels (EALs) for VCSNS Units 2 and 3 to the NRC in accordance with NEI 07-01, Revision 0. These fully developed EALs shall be submitted to the NRC for confirmation at least 180 days prior to initial fuel load. The submitted EALs will be written with no deviations.

13.3.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

The applicable regulatory requirements and guidance for EP are as follows:

- 10 CFR 52.79(a)(21), "Contents of Applications; Technical Information in Final Safety Analysis Report" and 10 CFR 52.79(a)(22)(i) require that the FSAR include emergency plans that comply with the requirements of 10 CFR 50.47, "Emergency plans," and Appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities" to 10 CFR Part 50, "Domestic licensing of production and utilization facilities," and certifications from State and local governmental agencies with EP responsibilities. Under 10 CFR 50.47(a)(1)(ii), no initial COL under 10 CFR Part 52, "Licenses, certifications, and approvals for nuclear power plants" will be issued unless a finding is made by the NRC that there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. In addition, under 10 CFR 50.47(a)(2), the NRC will base its finding on a review of the FEMA findings and determinations as to whether State and local emergency plans are adequate, and whether there is reasonable assurance that they can be implemented, and on the NRC assessment as to whether the applicant's onsite emergency plans are adequate and whether there is reasonable assurance that they can be implemented.

- The staff considered the applicable requirements in 10 CFR 52.77, "Contents of applications; general information"; 10 CFR 52.80, "Contents of applications; additional technical information"; 10 CFR 50.33(g), and 10 CFR 100.21, "Non-seismic siting criteria."

- NUREG-0800 identifies NUREG-0654/FEMA-REP-1, Revision 1 and other related guidance that the staff considered during its review. The related acceptance criteria are identified in NUREG-0800, Section 13.3.II and the applicable regulatory guidance for reviewing emergency preparedness as an operational program is established in NUREG-0800 Section 13.4.

- In addition, Appendix A to 44 CFR 353, "Memorandum of Understanding (MOU) Between Federal Emergency Management Agency and Nuclear Regulatory Commission Relating to Radiological Emergency Planning and Preparedness," September 14, 1993, states that FEMA is responsible for making findings and determinations as to whether offsite emergency plans are adequate and can be implemented. FEMA radiological emergency preparedness (REP) guidance documents provide guidance on various topics for use by State and local organizations responsible for radiological emergency preparedness and response. NUREG-0654/FEMA-REP-1, Revision 1, provides guidance to provide a basis for State and local governments to develop radiological emergency plans.

13.3.4 Technical Evaluation

The NRC staff reviewed Section 13.3 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to EP. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Tier 2 Departure

- VCS DEP 18.8-1

The NRC staff's evaluation related to VCS Departure (DEP) 18.8-1 is addressed in Attachment 13.3A of this SER.

AP1000 COL Information Items

- STD COL 13.3-1
- STD COL 13.3-2

The NRC staff's evaluation related to STD COL 13.3-1 and 13.3-2 is addressed in Attachment 13.3A of this SER.

Supplemental Information

- STD SUP 13.3-1

The NRC staff's review of STD SUP 13.3-1 is addressed in Attachment 13.3A of this SER.

The NRC staff's review of the information provided in the application that is not part of the VCSNS Emergency Plan is addressed in Attachment 13.3B, “Emergency Planning Information in the Application,” of the SER. The NRC staff’s review of the VCSNS Emergency Plan is addressed in Attachment 13.3C, “Onsite Emergency Plan,” of the SER.

In addition, the staff conducted site area visits on January 27-28, 2009 and March 28, 2009, to the VCSNS site, consisting of reviews of the proposed plant location and various areas within the 10-mile emergency planning zone (EPZ).

The NRC staff also reviewed the application against the generic EP ITAAC provided in Table 14.3.10-1, “Emergency Planning-Generic Inspections, Tests, Analyses, & Acceptance Criteria (EP ITAAC),” pursuant to Section 14.3.10 of NUREG-0800.

FEMA has reviewed the emergency plans for the State of South Carolina and the local government plans for Lexington, Newberry, Richland, and Fairfield counties in accordance with 44 CFR 350 and provided its Interim Findings Report (IFR) for Reasonable Assurance, dated June 30, 2010. FEMA has determined that the plans are adequate, and there is reasonable assurance that the plans can be implemented with no corrections needed. The NRC staff has reviewed the FEMA report and based its overall reasonable assurance finding on the FEMA findings and determinations regarding offsite emergency planning.

Based on the staff’s evaluation of the applicant’s emergency plan found in Attachment 13.3C, the staff finds that the applicant’s onsite emergency plan meets the standards in 10 CFR 50.47(b) and the requirements in Appendix E to 10 CFR Part 50.

Based on the IFR and the staff’s evaluations detailed in Attachments 13.3A, 13.3B, and 13.3C of this SER, the staff finds that there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. Therefore, the staff finds that the VCSNS emergency plan meets the requirements in 10 CFR 50.33(g), 10 CFR 50.34(b)(6)(v), 10 CFR 50.34(f)(2), 10 CFR 50.47, Appendix E to 10 CFR Part 50, 10 CFR 52.77.

License Conditions

- Part 10, License Condition 1

The applicant provided a license condition in Part 10 of the VCSNS COL application, which will incorporate the ITAAC identified in the tables in Appendix B. Appendix B includes the EP ITAAC. License Condition 1’s proposed text is evaluated in Chapter 1 of this SER.

The NRC staff’s evaluation of the EP ITAAC identified in Table 3.8-1 of Appendix B to Part 10 of the VCSNS COL application is documented in Section 13.3C.19 of the SER. Table 13.3-1 of this SER provides the EP ITAAC identified in Table 3.8-1 of Appendix B to Part 10 of the VCSNS COL application, as modified by the applicant’s letters dated May 18, 2010, and June 28, 2011. Therefore, the staff will include the ITAAC in SER Table 13.3-1 for EP in the license.

- Part 10, License Condition 6

The applicant proposed a license condition to provide a schedule to support the NRC's inspection of operational programs including the EP. Specifically, the applicant proposed the following:

> The licensee shall submit to the appropriate Director of the NRC, a schedule, no later than 12 months after issuance of the COL, that supports planning for and conduct of NRC inspections of operational programs listed in the operational program FSAR Table 13.4-201. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until either the operational programs in the FSAR table have been fully implemented or the plant has been placed in commercial service, whichever comes first.

The staff reviewed the above proposed license condition against the recommendations in SECY-05-0197 as endorsed by the related Staff Requirements Memorandum (SRM) dated February 22, 2006. The staff concludes that this proposed license condition conforms to the guidance in SECY-05-0197 and is, therefore, acceptable. For additional details on the staff's evaluation of proposed License Condition 6, see Section 13.4.4 of this SER.

- Part 10, License Condition 11

The applicant proposed a license condition related to the plant-specific EALs. Specifically, the applicant proposed the following:

> The licensee shall submit a fully developed set of plant-specific Emergency Action Levels (EALs) for VCSNS Units 2 and 3 in accordance with NEI-07-01 Revision 0. These fully developed EALs shall be submitted to the NRC for confirmation at least 180 days prior to initial fuel load. The submitted EALs will be written with no deviations.

The NRC staff's evaluation of the EALs is documented in Section 13.3C.4 of the SER.

The staff has revised the proposed license condition as follows:

> The licensee shall submit a fully developed set of plant-specific Emergency Action Levels (EALs) for VCSNS Units 2 and 3 in accordance with NEI-07-01 Revision 0. <u>The EALs shall have been discussed and agreed upon with State and local officials.</u> These fully developed EALs shall be submitted to the NRC for confirmation at least 180 days prior to initial fuel load. The submitted EALs will be written with no deviations.

With this modification, the staff finds this license condition to be acceptable.

In EP ITAAC 8.1.3 the applicant proposed that if offsite exercise deficiencies were not corrected prior to the 10 CFR 52.103(g) finding, then a license condition that requires offsite full participation exercise deficiencies to be corrected prior to operation above 5 percent of rated power will be requested. A reference to this license condition is not required in EP ITAAC 8.1.3 because this license condition is now provided in 10 CFR 50.54(gg).

The applicant has proposed a license condition to the EP ITAAC 8.1.3 that requires offsite exercise deficiencies to be corrected prior to operation above 5 percent of rated power as described in 10 CFR 50.54(gg). This will be tracked as **Confirmatory Item 13.3-1**.

Correction and Resolution of Confirmatory Item 13.3-1

To resolve Confirmatory Item 13.3-1, the applicant committed to revise EP ITAAC 8.1.3 in Part 10 of the COL application to include a reference to 10 CFR 50.54(gg). The staff verified that Part 10 of the COL application included this revision to EP ITAAC 8.1.3. However, the staff has reconsidered the content of EP ITAAC 8.1.3 and notes the following issue associated with this ITAAC:

- Initially in the November 19, 2010, advanced safety evaluation (ASE), Section 13.3 indicated that a reference to a license condition in EP ITAAC 8.1.3 was not required and that a reference to 10 CFR 50.54(gg) was necessary. However, since the requirements of 10 CFR 50.54(gg) are a license condition (i.e., the title of 10 CFR 50.54 is "Conditions of licenses"), the staff has determined that referring to a license condition is appropriate and that referring to 10 CFR 50.54(gg) in EP ITAAC 8.1.3 is redundant and unnecessary.

Based on the staff's reconsideration, differences now exist between the EP ITAAC 8.1.3 proposed by the applicant in Part 10 of its COL application and Table 13.3-1 of this FSER. The difference being that the applicant's proposed EP ITAAC 8.1.3 includes a reference to 10 CFR 50.54(gg) while Table 13.3-1 of this FSER does not.

Therefore, the staff proposes to include the applicant's proposed EP ITAAC 8.1.3 in Table 13.3-1 of this FSER, which includes a reference to a license condition but the staff does not propose including the applicant's proposed reference to 10 CFR 50.54(gg). Because EP ITAAC 8.1.3 will be based on FSER Table 13.3-1, further updating of Part 10 of the application is not necessary. As a result, Confirmatory Item 13.3-1 is now closed.

The NRC staff's evaluation of the ITAAC identified in Table 3.8-1 of Appendix B to Part 10 of the VCSNS COL application is documented in Section 13.3C.19 of the SER. Table 13.3-1 of this SER provides the EP ITAAC identified in Table 3.8-1 of Appendix B to Part 10 of the VCSNS COL application, as modified by the applicant's letter dated August 24, 2010. The staff finds that a specific license condition is not required because this requirement is now specifically addressed in 10 CFR 50.54(gg).

Correction of Last Paragraph in Section 13.3.4

The last sentence of the last paragraph in Section 13.3.4 of the ASE, as indicated above, stated that "the staff finds that a specific license condition is not required because this requirement is now specifically addressed in 10 CFR 50.54 (gg)." As stated above, the staff has reconsidered its position documented in the ASE. Therefore, the last sentence of the last paragraph in Section 13.3.4 has been revised to state the following:

> *The staff finds that a reference to 10 CFR 50.54(gg) is not required because the requirements of 10 CFR 50.54(gg) are a license condition.*

13.3.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff finds the following ITAAC and license conditions acceptable:

- The licensee shall perform and satisfy the ITAAC defined in SER Table 13.3-1, "Emergency Plan ITAAC."

- License Condition (13-3) – No later than 12 months after issuance of the COL, the licensee shall submit to the Director of NRO a schedule that supports planning for and conduct of NRC inspections of the EP program implementation. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the EP operational program has been fully implemented.

- License Condition (13-4) – The licensee shall submit a fully developed set of plant-specific EALs for VCSNS Units 2 and 3 in accordance with Nuclear Energy Institute (NEI) 07-01, "Methodology for Development of Emergency Action Levels Advanced Passive Light Water Reactors," Revision 0. The EALs shall have been discussed and agreed upon with State and local officials. These fully developed EALs shall be submitted to the NRC for confirmation at least 180 days prior to initial fuel load. The submitted EALs will be written with no deviations.

13.3.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to EP, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The ITAAC that are applicable to EP for VCSNS are included in SER Table 13.3-1 and are addressed in Section 13.3C.19. Pursuant to 10 CFR 52.80(a), the VCSNS COL application includes the proposed inspections, tests, and analyses that the licensee shall perform, and the acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in conformity with the license, the provisions of the Atomic Energy Act, and the NRC's rules and regulations.

FEMA has reviewed the emergency plans for the State of South Carolina and the local government plans for Lexington, Newberry, Richland, and Fairfield counties in accordance with 44 CFR 350 and provided its IFR for Reasonable Assurance, dated June 30, 2010. FEMA has determined that the plans are adequate, and there is reasonable assurance that the plans can be implemented with no corrections needed. The NRC staff has reviewed the FEMA report and based its overall reasonable assurance finding on the FEMA findings and determinations regarding offsite emergency planning.

Based on the staff's evaluation of the applicant's emergency plan for proposed Units 2 and 3 found in Attachment 13.3C, the staff finds that the applicant's onsite emergency plan meets the standards in 10 CFR 50.47(b) and the requirements in Appendix E to 10 CFR Part 50.

Based on the IFR and the staff's evaluations detailed in Attachments 13.3A, 13.3B, and 13.3C of this SER, the staff finds that there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. Therefore, the staff finds that the VCSNS emergency plan meets the requirements in 10 CFR 50.33(g); 10 CFR 50.34(b)(6)(v); 10 CFR 50.34(f)(2); 10 CFR 50.47; Appendix E to 10 CFR Part 50; 10 CFR 52.77; 10 CFR 52.79(a)(21); 10 CFR 52.79(a)(22)(i); 10 CFR 52.80; 10 CFR 52.81, "Standards for review of applications"; and 10 CFR 52.83, "Finality of referenced NRC approvals; partial initial decision on site suitability."

Attachment 13.3A – COL Information Items, Supplemental Information Items and Departures

Introduction

This section addresses the COL information items, supplemental information items and departures associated with EP.

13.3A.1 Regulatory Basis

The applicable regulatory requirements related to VCS DEP 18.8-1, dealing with the locations of the OSC and TSC, are established in 10 CFR 50.34(f)(2)(xxv) and the guidance provided in NUREG-0654/FEMA-REP-1.

The applicable regulatory requirements for STD COL 13.3-1 and STD COL 13.3-2, dealing with EP, are in 10 CFR 50.33(g), 10 CFR 52.79(a)(21), 10 CFR 50.47(b)(2) and (6) and the guidance provided in NUREG-0654/FEMA-REP-1.

With respect to STD SUP 13.3-1, the guidance related to implementation milestones for the EP program is provided in Sample FSAR Table 13.4-X, "Operational Programs Required by NRC Regulation and Program Implementation," in NUREG-0800.

13.3A.2 COL Information Items

Technical Information in the Application:

- STD COL 13.3-1

In a letter dated August 11, 2010, the applicant submitted a proposed revision to VCSNS COL FSAR Section 13.3, "Emergency Planning," that included supplemental information to incorporate by reference the emergency planning information into the FSAR, as required by 10 CFR 52.79(a)(21). The revised STD COL 13.3-1 states:

> The emergency planning information is submitted to the Nuclear Regulatory Commission as a separate licensing document and is incorporated by reference. (See Table 1.6-201.)
>
> Post-72 hour support actions, as discussed in DCD Sections 1.9.5.4 and 6.3.4, are addressed in DCD Sections 6.2.2, 8.3, and 9.1.3. Provisions for establishing post-72 hour action ventilation for the main control room, instrumentation and controls rooms, and direct current (dc) equipment rooms are established in operating procedures.

The applicant's commitment to incorporate the change to FSAR Section 13.3 in a future revision of the COL application is **Confirmatory Item 13.3-2**.

Resolution of Confirmatory Item 13.3-2

Confirmatory Item 13.3-2 is an applicant commitment to update its FSAR to include an incorporated by reference statement for the emergency plans. The staff verified that VCSNS

COL FSAR Section 13.3 was appropriately updated (or revised). As a result, Confirmatory Item 13.3-2 is now closed.

- STD COL 13.3-2

In Section 13.3 of the VCSNS COL FSAR, STD COL 13.3-2 states:

> The emergency plan describes the plans for coping with emergency situations, including communication interfaces and staffing of the emergency operations facility.

In RAI 13.3-29(A), the staff asked the applicant to explain why communication interfaces were not addressed. The applicant responded that a stand-alone TSC is provided for the VCSNS site and will serve Units 1, 2, and 3. Therefore, the communications interfaces will not be dependent on the AP1000 DCD design of the TSC.

In addition, the applicant responded that Section 13.3 states:

> The emergency plan describes the plans for coping with emergency situations, including communication interfaces and staffing of the emergency operations facility.

In RAI 13.3-29(B), the staff asked the applicant to discuss why the staffing of the emergency operations facility (EOF) was not addressed. The applicant responded that in Section 2.H.2, "Activation and Staffing of Emergency Response Facilities," of the VCSNS Emergency Plan, activation of the EOF is mandatory upon the declaration of an "alert" or higher emergency classification. The EOF must establish communications with the affected unit's control room prior to activating and assuming the duties of emergency classification, notification of offsite authorities, issuing protective action recommendations for the general public, and approval of press releases. Figures B-1a and B-1c of the VCSNS Emergency Plan provide graphically the minimum staffing for the EOF to be activated. Section 2.B.3 requires "a formal turnover between the Interim Emergency Director (IED) relinquishing Command and Control and the Emergency Director (ED) assuming Command and Control has been made." Therefore, a minimum staffing level is required in the EOF prior to activation of the facility. In addition, communications must be established with the affected unit's control room prior to assuming the command and control for the emergency response effort. The applicant's response to RAI 13.3-29(B) refers to Section 2.H.2, of the VCSNS Emergency Plan, which states that the emergency response facilities (ERFs) are staffed and activated in accordance with the emergency plan implementing procedures (EPIPs). In RAI 13.3-42, the staff requested additional information to address specific timeliness goals associated with activating and staffing the ERFs. In its response, the applicant provided additional information that is addressed in Section 2.H.5 of the VCSNS Emergency Plan, which adequately addressed the RAI.

Technical Evaluation:

- STD COL 13.3-1

The applicant responses to RAIs 13.3-29(A) and (B) and 13.3-42 are acceptable because they meet the guidance in NUREG-0654/FEMA-REP-1. The applicant has proposed operating procedures to address post-72 hour support actions through reference to the AP1000 DCD that specifically address an extended loss of nonsafety-related systems or both offsite or onsite

alternating current (ac) power sources for more than 72 hours. The NRC staff evaluates these procedures in SER Section 13.5. Therefore, the staff finds STD COL 13.3-1, addressing emergency planning including post-72 hour actions and its communication interface, acceptable because the applicant provided an emergency plan in accordance with 10 CFR 52.79(a)(21).

- STD COL 13.3-2

The staff finds STD COL 13.3-2, addressing the activation of the emergency operations facility consistent with current operating practices and NUREG-0654/FEMA-REP-1 acceptable because the applicant provided this information, which meets the requirements of the applicable portions of 10 CFR 50.47(b)(2) and (6). The acceptability of this information is evaluated in Sections 13.3C.6 and 13.3C.8 of this SER.

13.3A.3 Supplemental Information Items

Technical Information in the Application:

- STD SUP 13.3-1

The applicant provided the following text to VCSNS COL FSAR Section 13.3 to address STD SUP 13.3-1:

> Table 13.4-201 provides milestones for emergency planning implementation.

Technical Evaluation:

- STD SUP 13.3-1

As part of STD SUP 13.3-1, the applicant provided milestones for the EP program implementation in Table 13.4-201, "Operational Programs Required by NRC Regulations," of the VCSNS COL FSAR. The staff finds the milestones to be acceptable as they are consistent with NUREG-0800. The staff's evaluation of emergency planning milestones to support issuance of 10 CFR Parts 30, 40, and 70 licenses is in Section 1.5 of this SER.

13.3A.4 Departures

Technical Information in the Application: Tier 2 Departure

In Part 2 of the VCSNS COL FSAR, the applicant incorporated by reference Section 18.8, "Human System Interface Design," of Revision 17 of the AP1000 DCD. However, the applicant identified the following departure:

- VCS DEP 18.8-1 relates to the locations of the TSC and the OSC for each unit.

In a letter dated August 11, 2010, the applicant submitted a revision to Part 7, "Departures and Exemptions," of the COL application to address changes made to the DCD resulting from resolution of OI-TR107-NSIR-07. In its January 27, 2010, response to OI-TR107-NSIR-07, Westinghouse changed the TSC location designation in DCD Section 18.8.3.5 from Tier 2* to Tier 2. In its revised Part 7, the applicant stated that the TSC at VCSNS will not be located in the control support area (CSA) as identified in AP1000 DCD, Section 18.8.3.5. The TSC

location is to be in a central location such that a single TSC can serve all three VCSNS units. Additionally, the VCSNS OSC is being moved from the location identified in AP1000 DCD Sections 18.8.3.6 and 12.5.2.2 and as described in AP1000 DCD Figure 1.2-18. The OSC is being moved to the CSA vacated by the move of the TSC. The technical evaluation of this departure is in Section 13.3C.8 of this SER. The commitment to update the application with the revision to Part 7 of the application is tracked as **Confirmatory Item 13.3-3**.

Resolution of Confirmatory Item 13.3-3

Confirmatory Item 13.3-3 is an applicant commitment to update its COL application Part 7, to remove reference to the TSC location being Tier 2* information. The staff verified that the VCSNS COL application Part 7 was appropriately updated. As a result, Confirmatory Item 13.3-3 is now closed.

Technical Evaluation:

- VCS DEP 18.8-1

In its letter dated August 11, 2010, the applicant's evaluation, in accordance with 10 CFR Part 52, Appendix D, Section VIII, Item B.5, determined that this departure did not require prior NRC approval. As discussed in SER Section 13.3C8, the staff finds the proposed locations of the TSC and OSC meet the applicable regulatory requirements and are, therefore, acceptable. Because the proposed location of the TSC and OSC are acceptable, the staff finds VCS DEP 18.8-1 acceptable.

13.3A.5 Post Combined License Activities

There are no post-COL activities related to this section.

13.3A.6 Conclusions

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to EP, and there is no outstanding information expected to be addressed in the VCSNS COL application FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The NRC staff has compared the COL information items and supplemental information items in the VCSNS COL application to the applicable NRC regulations and other NRC regulatory guides and concludes that the applicant is in compliance with the applicable regulatory requirements in 10 CFR 50.33(g), 10 CFR 52.79(a)(17), 10 CFR 52.79(a)(21), 10 CFR 50.34(f)(2)(xxv), 10 CFR 50.47(b)(2) and (6), and the applicable guidance provided in NUREG-0654/FEMA-REP-1, and in NUREG-0800.

Attachment 13.3B – Emergency Planning Information in the Application

Introduction

This section of the SER includes the NRC staff's evaluation of EP information that is required to be provided in the COL application, but does not address the applicant's plans for responding to a radiological emergency, which are evaluated in Attachment 13.3C in this SER.

13.3B.1 Regulatory Basis[14]

The applicable regulatory requirements for EP information are as follows:

- 10 CFR Part 50, Appendix E, Section I, "Introduction," describes the EPZ.

- 10 CFR Part 50, Appendix E, Section E.III, "The Final Safety Analysis Report," requires that the FSAR include plans for coping with emergencies.

- 10 CFR 52.79(a)(21), "Contents of Applications; Technical Information in the Final Safety Analysis Report," and 10 CFR 50.34(b)(6)(v), "Contents of Applications; Technical Information," also require that the FSAR include an onsite emergency plan that meets the requirements in 10 CFR 50.47 and 10 CFR Part 50, Appendix E.

- 10 CFR 50.33, "Content of Application: General Information" and 10 CFR 52.77, "Contents of Applications; General Information," require in part, the submittal of State and local emergency plans.

- 10 CFR 50.33(g) requires, in part, a description of the plume exposure pathway and the ingestion pathway EPZs. In addition, 10 CFR 50.47(c)(2), "Emergency Plans," states generally, the plume exposure pathway EPZ for nuclear power plants shall consist of an area about 10 miles (16 kilometers [km]) in radius and the ingestion pathway EPZ shall consist of an area about 50 miles (80 km) in radius. The exact size and configuration of the EPZs surrounding a particular nuclear power reactor shall be determined in relation to local emergency response needs and capabilities as they are affected by such conditions as demography, topography, land characteristics, access routes, and jurisdictional boundaries. The plans for the ingestion pathway shall focus on such actions as are appropriate to protect the food ingestion pathway.

- 10 CFR 50.34(b)(6)(v) requires plans for coping with emergencies, which shall include the items specified in Appendix E. 10 CFR 50.34(h)(1)(i) and 10 CFR 52.79(a)(41) require that the COL application include an evaluation of the facility against NUREG-0800. Section 13.3 of NUREG-0800 provides guidance for the review of onsite emergency plans for nuclear power plants. 10 CFR 50.34(h)(2) and (3) require that the evaluation identify and describe all differences from the NUREG-0800 acceptance criteria in Section 13.3 and evaluate how the proposed alternatives to the NUREG-0800 criteria provide an acceptable method of complying with the Commission's regulations. Where differences exist, the evaluation should discuss how the proposed alternative

[14] The bracketed [ ], alphanumeric designations used throughout this SER section identify the corresponding NUREG-0654/FEMA-REP-1 evaluation criteria used by the staff to determine compliance with 10 CFR 50.47(b).
Braces { } identify requirements in Appendix E to 10 CFR Part 50.
Parentheses ( ) identify other applicable regulatory requirements

provides an acceptable method of complying with the Commission's regulations or portions thereof that underlie the corresponding NUREG-0800 acceptance criteria.

- 10 CFR 52.73, "Relationship to other subparts," states that the application for a COL may reference a standard design.

- 10 CFR 52.79(a)(22)(i), requires certifications from State and local governmental agencies with EP responsibilities that: (1) the proposed emergency plans are practicable; (2) these agencies are committed to participating in any further development of the plans, including any required field demonstrations; and (3) these agencies are committed to executing their responsibilities under the plans in the event of an emergency.

- 10 CFR 52.81, states that COL applications will be reviewed according to the standards in 10 CFR Parts 50 and 100. Therefore, the requirements of 10 CFR Part 100, "Reactor site criteria," Subpart B, "Evaluation Factors for Stationary Power Reactor Site Applications on or after January 10, 1997," are applicable. 10 CFR 100.1(c), "Reactor Site Criteria, Purpose," requires the identification of physical characteristics unique to the proposed site that could pose a significant impediment to the development of emergency plans. In addition, 10 CFR 100.21(g) also requires that applications for site approval identify physical characteristics unique to the proposed site.

- 10 CFR 100.1(c) states siting factors and criteria are important in assuring that radiological doses from normal operation and postulated accidents will be acceptably low, that natural phenomena and potential man-made hazards will be appropriately accounted for in the design of the plant, that site characteristics are such that adequate security measures to protect the plant can be developed, and that physical characteristics unique to the proposed site that could pose a significant impediment to the development of emergency plans are identified.

- 10 CFR 100.21(g) states physical characteristics unique to the proposed site that could pose a significant impediment to the development of emergency plans must be identified.

13.3B.2 FSAR and Onsite Emergency Plan

Technical Information in the Application: {Appendix E, Section III} (10 CFR 52.79(a)(21)) (10 CFR 50.34(b)(6)(v)) Section 13.3 of the VCSNS COL FSAR states in STD COL 13.3-1 that EP information is submitted to the NRC as a separate licensing document. The document is Part 5, "Emergency Plan," (VCSNS Emergency Plan) of the COL application. Section I.B, Scope, states the plan applies to planning for and responding to any radiological condition at the VCSNS. Section I.C.1, Planning Basis, of the VCSNS Emergency Plan states that consistent with the requirements of both 10 CFR Part 50 and 10 CFR Part 52, this plan is based on the requirements of 10 CFR 50.47, "Emergency plans," and 10 CFR Part 50, Appendix E. The VCSNS Emergency Plan also includes three annexes and six appendices that provide additional detailed information on various aspects of the onsite emergency plan.

Technical Evaluation: {Appendix E, Section III} (10 CFR 52.79(a)(21)) (10 CFR 50.34(b)(6)(v)) The staff finds that the VCSNS COL FSAR includes an emergency plan for coping with emergencies at the VCSNS site, which meets the applicable requirements

in Section III of Appendix E to 10 CFR Part 50, 10 CFR 52.79(a)(21), and 10 CFR 50.34(b)(6)(v).

13.3B.3 Submittal of State and Local Emergency Plans

Technical Information in the Application: (10 CFR 50.33(g)) The "Explanatory Notes Regarding the Emergency Plan and Supplemental Information," of the VCSNS Emergency Plan states that current State and local EP documents are included as supplemental information. The list of State and local EP documents includes:

- South Carolina Emergency Operations Plan
- South Carolina Operational Radiological Emergency Response Plan
- South Carolina Technical Radiological Emergency Response Plan
- South Carolina Proposed Emergency Operations Plan
- South Carolina Proposed Operational Radiological Emergency Response Plan
- South Carolina Proposed Technical Radiological Emergency Response Plan
- Fairfield County, South Carolina Radiological Emergency Plan
- Newberry County, South Carolina Radiological Emergency Plan
- Lexington County, South Carolina Radiological Emergency Plan
- Richland County, South Carolina Radiological Emergency Plan

In RAI 13.3-32, the staff requested that SCE&G discuss measures, or show documentation that the VCSNS Emergency Plan has been coordinated with the Catawba Indian Nation. The Catawba Indian Nation Office of Tribal Government is located in Rock Hill, South Carolina (within the 50 mile Ingestion Pathway Emergency Planning Zone (IPZ). The applicant responded with a letter of certification that the York County Emergency Management Agency coordinates all emergency management issues for the Catawba Indian Nation.

Technical Evaluation: (10 CFR 50.33(g)) The staff finds the applicant's response to RAI 13.3-32 acceptable because the Catawba Indian Nation is covered, by agreement, with a county level Emergency Management Agency. The applicant submitted offsite emergency plans for State and local governmental entities that are wholly or partially within the plume exposure pathway EPZ. These State and local governmental entities include: South Carolina and Fairfield, Lexington, Newberry, and Richland Counties in South Carolina. The offsite emergency plans for the State governments wholly or partially within the ingestion pathway EPZ were also submitted for South Carolina. This is acceptable because it meets the requirements in 10 CFR 50.33(g).

13.3B.4 Description of the Emergency Planning Zones

Technical Information in the Application: {Appendix E, Section I} (10 CFR 50.47(c)(2)) Section B, "Background-Emergency Planning Zones, in Part 5," "Emergency Plan," of the COL application describes plume exposure pathway and ingestion pathway EPZs. The plume exposure pathway EPZ consists of an area about 10 miles in radius around the site. Figure 1-3, "10 mile Emergency Planning Zone," provides an illustration of the plume exposure pathway EPZ. The plume exposure pathway EPZ is also described to be the area where the principal sources of incident-related radiation exposures are likely to be whole body gamma radiation exposures and inhalation exposures form the passing radioactive plume.

In RAI 13.3-27, the staff asked why the plume exposure pathway description did not include whole body external exposure to gamma radiation from deposited material as specified in NUREG-0396/EPA 520/1-78-016, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Reactors." The applicant responded and identified the definition section as the location in the plan that accurately described the correct citation that the EPZ included whole body external exposure to gamma radiation from deposited material.

Section B also includes a description of the ingestion pathway EPZ. The ingestion pathway EPZ consists of an area about 50 miles in radius around the site. Figure I-4, "50 Mile Emergency Planning Zone," of the VCSNS Emergency Plan provides an illustration of the ingestion exposure pathway EPZ.

Technical Evaluation: {Appendix E, Section I} (10 CFR 50.47(c)(2))

FEMA, as part of the development of the IFR for Reasonable Assurance (SER Section 13.3.4), requested that the applicant clarify the EPZ size since Units 2 and 3 were proposed to be built approximately 1 mile southwest of the existing Unit 1. In its response, the applicant stated that it considers the property containing the existing operating unit and the proposed Units 2 and 3 to be one homogeneous site. Consistent with the guidance in NUREG-0654/FEMA-REP-1, the EPZ boundaries currently in place were based on demography, topography, land characteristics, access routes, and jurisdictional boundaries and these EPZ boundaries are considered to be the appropriate size and shape for emergency planning purposes. When considering all the different attributes, the established EPZ did not reach out to include an entire 10-mile radius in all cases even for Unit 1. However this boundary has been appropriate for the emergency planning needs of the surrounding areas. Facilities, equipment and emergency planning procedures currently exist to support this EPZ. Based on FEMA's RAI, the applicant conducted subsequent discussions regarding the existing EPZ boundary with the affected counties (Fairfield, Newberry, Richland and Lexington). As a result, each of the counties passed resolutions to maintain the existing Unit 1 EPZ for the additional Units 2 and 3.

The FEMA staff found the response to its RAI adequate. The IFR stated there were no deficiencies, nor any areas needing corrective actions.

The staff finds the applicant's response to RAI 13.3-27 acceptable because the applicant conforms to the guidance in NUREG-0396 and the acceptance criteria in NUREG-0800. In addition, the onsite emergency plan describes the plume exposure pathway EPZ as consisting of an area about 10 miles in radius and the ingestion pathway EPZ consisting of an area about 50 miles in radius. The exact size and configuration of the EPZs surrounding a particular nuclear power reactor were determined in relation to the local emergency response needs and capabilities as they are affected by such conditions as demography, topography, land characteristics, access routes, and jurisdictional boundaries.

Based on FEMA's findings, the VCSNS Emergency Plan, and the applicant's response to RAI 13.3-27, the NRC staff finds that the EPZ size is acceptable and meets the requirements in 10 CFR 50.33(g), 10 CFR 50.47(c)(2), and Section 1 of Appendix E to 10 CFR Part 50.

13.3B.5 Certifications from State and Local Governments

Technical Information in the Application: (10 CFR 52.79(a)(22)(i)) The VCSNS Emergency Plan did not provide any Letters of Certification in the COL application. In the acceptance

review of the VCSNS COL, the staff requested the applicant provide additional Letters of Certification from the offsite response agencies that address the revised Emergency Plan for the proposed Units 2 and 3. In RAI 13.3-17(A), the staff requested additional information on the existing Letters of Agreement with the various offsite response agencies listed in the VCSNS Emergency Plan. The applicant provided certifications from the State and local governmental agencies with EP responsibilities to supplement the COL application dated June 26, 2008. Certifications were received from the State of South Carolina Emergency Management, and Fairfield, Lexington, Newberry, and Richland Counties in South Carolina which stated that (1) the proposed emergency plans are practicable; (2) these agencies are committed to participating in any further development of the plans, including any required field demonstrations; and (3) these agencies are committed to executing their responsibilities under the plans in the event of an emergency. Appendix 2, "Letters of Agreement," of the VCSNS Emergency Plan lists the current Letters of Agreements with VCSNS. Letters of Agreement and/or MOU are reviewed annually and updated as required.

Technical Evaluation: (10 CFR 52.79(a)(22)(i)) The staff finds the response to RAI 13.3-17(A) adequate. The staff finds the certifications acceptable because they meet the requirements of 10 CFR 52.79(a)(22)(i).

13.3B.6 Evaluation Against the Standard Review Plan

Technical Information in the Application: (10 CFR 52.79(a)(41)) (10 CFR 50.34(h)(1)(i)) (10 CFR 50.34(h)(2 and 3)) The VCSNS COL FSAR Table 1.9-202, "Conformance with SRP Acceptance Criteria," in STD SUP 1.9-1 indicates conformance with the acceptance criteria in NUREG-0800 is acceptable for Section 13.3. However, acceptance criteria related to EP in Section 13.3 of the NUREG-0800 was not evaluated against Part 5 of the COL application. In RAI 13.3-28, the staff requested an evaluation of the VCSNS Emergency Plan against NUREG-0800 and that the applicant identify all differences between the VCSNS Emergency Plan and NUREG-0800 Section 13.3, "Emergency Planning." In its response, the applicant provided a conformance table to confirm the evaluation of the VCSNS Emergency Plan against NUREG-0800 and also confirmed there were no differences.

Technical Evaluation: (10 CFR 52.79(a)(41)) (10 CFR 50.34(h)(1)(i)) (10 CFR 50.34(h)(2 and 3)) The staff finds the applicant's response to RAI 13.3-28 acceptable because it conforms to the guidance of NUREG-0800. The staff reviewed the applicant's evaluation of the VCSNS Emergency Plan against the applicable portions of Section 13.3 of NUREG-0800. The staff's evaluation confirmed that there were no differences from the NUREG-0800 acceptance criteria in Section 13.3 of NUREG-0800. This is acceptable because it meets the requirements of 10 CFR 52.79(a)(41), 10 CFR 50.34(h)(1)(i) and 10 CFR 50.34(h)(2 and 3).

13.3B.7 Reference to a Standard Design

Technical Information in the Application: (10 CFR 52.73) Section 13.3 of the VCSNS COL FSAR states that the AP1000 DCD is incorporated by reference with departures and supplements.

Technical Evaluation: (10 CFR 52.73) The staff finds that the AP1000 DCD was incorporated by reference in the VCSNS COL FSAR and the evaluation of the departures and supplements is addressed in Attachment 13.3A of this SER. This is acceptable because it meets the requirements of 10 CFR 52.73.

13.3B.8 Impediments to the Development of Emergency Plans

Technical Information in the Application: (10 CFR 52.81) (10 CFR 100.1(c)) (10 CFR 100.21(g)) Appendix 5, "Evacuation Time Estimates," to Part 5, "Emergency Plan," of the COL application states that the ETE report, "Virgil C. Summer, Development of Evacuation Time Estimates," dated August 2007, describes the analyses undertaken, and the results obtained by a study, to develop ETEs for the proposed VCSNS site. Also in Appendix 4, "Evacuation Time Estimates," to Part 5 of the VCSNS Emergency Plan, the applicant concluded that there are no physical characteristics unique to the VCSNS site that poses a significant impediment to the development of the proposed emergency plans. In addition, the applicant adequately identified physical characteristics unique to the proposed site by performing a preliminary analysis of the time required to evacuate various sectors and distances within the plume exposure pathway EPZ for transient and permanent populations and did not note any major impediments for an evacuation or other protective actions. This conclusion is based on the information in the ETE Report for the plume exposure pathway EPZ. The ETE Report provided an estimate of the time to evacuate the plume exposure pathway EPZ. In addition, the ETE Report examined the population distribution and transportation routes to determine whether there are any characteristics that pose a significant impediment to taking protective actions to protect the public in the event of an emergency. Populations that have special needs during an emergency are identified. In addition, no significant impediments to taking protective measures, such as egress limitations from the area surrounding the site were identified.

Technical Evaluation: (10 CFR 52.81) (10 CFR 100.1(c)) (10 CFR 100.21(g)) The applicant has demonstrated, through the use of the ETE Report that no physical characteristics unique to the proposed site could pose a significant impediment to the development of emergency plans. Therefore, the staff finds that the information is acceptable because it meets the requirements of 10 CFR 100.1(c), 10 CFR 100.21(g) and 10 CFR 52.81. The staff's review of the ETE Report is in Section 13.3C.18, "Evacuation Time Estimates (ETE) Analysis," of this SER.

13.3B.9 Post Combined License Activities

There are no post-COL activities related to this section.

13.3B.10 Conclusions

The NRC staff reviewed the EP information required by regulations to be in the application, but not required to be part of the VCSNS Emergency Plan provided in Part 5, "Emergency Plan," of the VCSNS COL application. The staff concludes that the information provided is acceptable and meets the applicable requirements and guidance in 10 CFR 50.33, 10 CFR 50.34(b)(6)(v), 10 CFR 50.34(f)(1), (2), and (3), 10 CFR 50.47(c)(2), 10 CFR 52.73, 10 CFR 52.77, 10 CFR 52.79, 10 CFR 52.81, 10 CFR 100.1(c), 10 CFR 100.21(g), and the applicable portions of Appendix E to 10 CFR Part 50 as discussed above.

Attachment 13.3C - Onsite Emergency Plan

Introduction

The NRC evaluates emergency plans for nuclear power reactors to determine whether the plans are adequate and there is reasonable assurance that the plans can be implemented. This attachment to the SER provides the results of the review of the onsite emergency plan for the proposed reactors at the VCSNS site.

VCSNS COL FSAR states in Section 13.3, "Emergency Planning," that the VCSNS Emergency Plan is included in Part 5 of the COL application. Also included as part of the onsite emergency plan are three annexes and six appendices, which provide additional detailed information on various aspects of the VCSNS Emergency Plan. In addition, Part 10 of the COL application includes a set of ITAAC related to the VCSNS Emergency Plan. Note: Although the applicant provided the Emergency Plan for Units 1, 2, and 3, this review only addresses the proposed Units 2 and 3.

The following section describes the NRC staff's evaluation of the onsite emergency plan for the VCSNS site and parallels the planning standards in NUREG-0654/FEMA-REP-1. Compliance with the guidance in NUREG-0654/FEMA-REP-1 for each planning standard meets the requirements of 10 CFR 50.47(b).

13.3C.1 Assignment of Responsibility (Organizational Control)

13.3C.1.1 Regulatory Basis

In determining whether the proposed emergency plan met the applicable regulatory requirements in 10 CFR 50.47(b)(1) for assignment of responsibility, the staff evaluated it against the detailed evaluation criteria[15] in NUREG-0654/FEMA-REP-1. The staff also evaluated the proposed emergency plan against applicable regulatory requirements related to the area of "Assignment of Responsibility (Organization Control)," in Appendix E to 10 CFR Part 50.[16]

13.3C.1.2 Overall Response Organization

Technical Information in the Emergency Plan: [A.1.a] Section 2.A.1, "Assignment of Responsibilities-Concept of Operations," of the VCSNS Emergency Plan provides a general discussion of the assignment of responsibility. Participating organizations include: South Carolina Electric and Gas (SCE&G), the South Carolina Departments of Emergency Management, Health and Environmental Control, Law Enforcement, and Natural Resources and the South Carolina Counties of Fairfield, Newberry, Lexington, and Richland. Federal agencies include the NRC, Department of Homeland Security (DHS), Department of Energy (DOE), Environmental Protection Agency (EPA), Federal Bureau of Investigation (FBI), FEMA, and the National Weather Service (NWS).

{Appendix E, Section IV.A.8} Section 1.A, "Purpose," of the VCSNS Emergency Plan states that the emergency plan establishes protective actions that are necessary in order to limit and

[15] The bracketed, alphanumeric designations used throughout this SER section identify the corresponding NUREG-0654/FEMA-REP-1 evaluation criteria used by the staff to determine compliance with 10 CFR 50.47(b).
[16] Braces identify requirements in Appendix E to 10 CFR Part 50.

mitigate the consequences of emergencies. The South Carolina Emergency Management Division (SCEMD) is responsible for proposing protective action recommendations (PARs) to the Governor of South Carolina. The SCEMD will also coordinate the implementation of the Governor's protective action decisions (PADs). Final recommendations for protective actions will be made by the governor. Protective actions are discussed in detail in Section J, "Protective Response." Section 5, "Emergency Measures," of each unit annex provides a description of unit-specific personnel protective actions, assembly areas, and evacuation routes.

Technical Evaluation: [A.1.a] The staff finds that the VCSNS Emergency Plan adequately provides a general discussion of the assignment of responsibilities and addresses protective actions. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and meets the requirements of 10 CFR Part 50, Appendix E.

{Appendix E, Section IV.A.8} The staff finds that the VCSNS Emergency Plan adequately identifies State and/or local officials responsible for planning for, ordering, and controlling appropriate protective actions, including evacuations when necessary. This is acceptable because it meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.1.3 Concept of the Operations

Technical Information in the Emergency Plan: [A.1.b] Section 2.A.1, "Concept of Operations," of the VCSNS Emergency Plan provides the concept of operations for SCE&G and its relationship to the total response effort. SCE&G will assess plant conditions, classify the emergency, activate the Emergency Response Organization (ERO) and ERFs, support offsite assessment, make PARs, monitor, control, and mitigate plant conditions, communicate to offsite agencies and terminate emergency conditions. The involvement of State, county, and Federal governments, as well as the participation of supporting agencies in the private sector are also briefly covered in this section.

{Appendix E, Section III} Chapter 13, "Conduct of Operations," of the VCSNS COL FSAR describes the organization of the VCSNS site and outlines individual responsibilities. A list of staffing is provided in Table 13.1-201, "Generic Position/Site Specific Position Cross Reference." Minimum on-duty staffing for the VCSNS site is provided in Table 13.1-202, "Minimum On-Duty Operations Shift Organization for Two-Unit Plant." Section 13.3.2 of the VCSNS COL FSAR states that the emergency plan describes the plans for coping with emergency situations, including communications interfaces and staffing of the EOF. Section A, "Assignment of Responsibility," of the VCSNS Emergency Plan describes the primary responsibilities and organizational control of SCE&G, Federal, State, county, and other support organizations. A block diagram outlining the interrelationships of supporting organizations is provided in Figure A-1, "Agency Response Organization Interrelationships." A list of Letters of Agreement (LOA) is provided in Appendix 2, "Letters of Agreement." These LOAs formalize the coordination of the response.

Technical Evaluation: [A.1.b] {Appendix E, Section III} The staff finds that the VCSNS Emergency Plan adequately describes the applicant's operational role, its concept of operations, and its relationship to the total effort. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and the requirements in Appendix E to 10 CFR Part 50.

13.3C.1.4 Organizational Interrelationships

Technical Information in the Emergency Plan: [A.1.c.] Figure A-1, "Agency Response Organization Interrelationships" of the VCSNS Emergency Plan includes a block diagram illustrating the interrelationships of participating organizations. In RAI 13.3-17(B), the staff requested a revision to Figure A-1 that would identify interaction between DOE, the VCSNS site, and State agencies. In its response, the applicant revised Section A.1.a.1.c to read as follows:

> If VCSNS or the affected states deem that assistance from DOE is necessary or desirable, they will request that assistance using the proper channels. VCSNS will contact the US NRC Headquarters and the affected state(s) will make contact through DHS.

Figure A-2, "VCSNS Augmented Emergency Response Organization Interrelationships," includes a block diagram of the interrelationships of the emergency response organizations following the activation of the EOF.

Technical Evaluation: [A.1.c.] The staff finds the additional information and textual revisions submitted in response to RAI 13.3-17(B) acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1 and the staff confirmed that Revision 1 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-17(B). The staff finds that the VCSNS Emergency Plan adequately illustrates the interrelationships of the participating organizations in emergency response in a block diagram and in text. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.1.5 Individual in Charge of Emergency Response

Technical Information in the Emergency Plan: [A.1.d] Section 2.A.1.c of the VCSNS Emergency Plan states the ED is responsible for coordinating emergency response action of the station, and the Emergency Public Information (EPI) Organization with affected State and county agencies. This position is held by a senior VCSNS employee. The Shift Supervisor for the affected unit who is the senior operations person on shift will serve as the IED until relieved by the ED.

Technical Evaluation: [A.1.d] The staff finds that the VCSNS Emergency Plan adequately identifies a specific individual by title that shall be in charge of the emergency response. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.1.6 24-Hour Response Capability

Technical Information in the Emergency Plan: [A.1.e.] Section 2.A.4, "Continuous Coverage," of the VCSNS Emergency Plan describes provisions for 24-hour per day emergency response, including 24-hour per day staffing of communications links. Section 2.A.1.d, of the VCSNS Emergency Plan states that procedures for training and maintenance of the emergency organization are in place to ensure 24-hour-per-day staffing for emergency response. Appendix 3, "Procedure Cross-Reference to the Emergency Plan," provides a list of implementing procedures for the VCSNS Emergency Plan that will be provided prior to fuel loading.

Technical Evaluation: [A.1.e.] The staff finds that the VCSNS Emergency Plan describes provisions for 24-hour per day emergency response, including 24-hour per day manning of communications links. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.1.7 Written Agreements

Technical Information in the Emergency Plan: [A.3] Section 2.A.3, "Agreements in Planning Effort," of the VCSNS Emergency Plan states written agreements between VCSNS and other support organizations have been developed. Agreements identify the emergency measures to be provided, the mutually accepted criteria for implementation, and the arrangements for exchange of information. A list of LOAs is provided in Appendix 2, "Letters of Agreement." In RAI 13.3-17(C), the staff requested that the applicant provide the LOAs to verify that the agreements have been made. In its response, the applicant provided copies of the Letters of Agreement or Memorandum of Understanding for the organizations listed in Appendix 2.

Technical Evaluation: [A.3] The staff finds the additional information and textual revisions submitted in response to RAI 13.3-17(C) acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1 and the staff confirmed that Revision 1 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-17(C). This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.1.8 Operations for a Protracted Period

Technical Information in the Emergency Plan: [A.4] Section 2.A.4, "Continuous Coverage," of the VCSNS Emergency Plan states that VCSNS maintains 24-hour emergency response capability. The normal on-shift complement is trained to handle emergency situations and will provide the initial response until relieved/augmented by the ERO. Personnel from the unaffected unit(s) will also be available. The ED has the authority and responsibility for assuring continuity of resources in the event of the activation of the ERO. In RAI 13.3-17(D), the staff requested additional information to identify a 24-hour point of contact. In its response, the applicant stated that the control room is the location of the 24-hour communication point of contact. The lED or the ED, whichever is in command, can be contacted through the use of the Electric Switch System Exchange (ESSX) line provided in the control room, TSC, and the EOF.

Technical Evaluation: [A.4] The staff finds the additional information submitted in response to RAI 13.3-17(D) acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1. The VCSNS Emergency Plan describes provisions for 24-hour per day emergency response, including 24-hour per day manning of communications links. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.1.9 Conclusions

On the basis of its review of the onsite emergency plan as described above for assignment of responsibility, the staff concludes that the information provided in the VCSNS Emergency Plan is acceptable and meets the requirements of 10 CFR 50.47(b)(1) because it complies with the guidance in Planning Standard A of NUREG-0654/FEMA-REP-1 and the applicable portions of Appendix E to 10 CFR Part 50 as described above.

13.3C.2 Onsite Emergency Organization

13.3C.2.1 Regulatory Basis

In determining whether the proposed emergency plan met the applicable regulatory requirements in 10 CFR 50.47(b)(2) for onsite emergency organization, the staff evaluated it against the detailed evaluation criteria in NUREG-0654/FEMA-REP-1. The staff also evaluated the proposed emergency plan against applicable regulatory requirements related to the area of "Onsite Emergency Organization," in Appendix E to 10 CFR Part 50.

13.3C.2.2 Normal Plant Operating Organization

Technical Information in the Emergency Plan: {Appendix E, Section IV.A.1} VCSNS COL FSAR Section 13.1 describes staffing. Table 2-1, "V.C. Summer ERO On-shift Staffing," of each unit annex and Table B-1a, "Shift Emergency Response Organization," of the VCSNS Emergency Plan outlines the unit on-shift emergency organization and its relation to the normal staff complement.

Technical Evaluation: {Appendix E, Section IV.A.1} The staff finds that the VCSNS Emergency Plan adequately describes the normal plant operating organization. This is acceptable because it meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.2.3 Onsite Emergency Organization

Technical Information in the Emergency Plan: [B.1] {Appendix E, Section IV.A.2.b} Section 2.B, "On Shift Emergency Response Organization Assignments," of the VCSNS Emergency Plan describes the minimum staffing requirements and responsibilities necessary to ensure initial emergency response operations are maintained at the station consistent with 10 CFR Part 50, Appendix E. A description of responsibilities of the normal staff complement is provided in Section 2.B.1, "On-Shift Emergency Response Organization (ERO) Assignments." The initial response to an emergency event will be provided by personnel on-shift who are trained and capable of performing response actions. Table 2-1, "V.C. Summer ERO On-shift Staffing," and Table B-1a, "Shift Emergency Response Organization," of each unit annex, outlines the unit on-shift emergency organization and its relation to the normal staff complement. The full ERO, discussed in Section 2.B.5.a, "Onsite ERO," will be activated at an "alert," "site area emergency," or "general emergency."

Technical Evaluation: [B.1] {Appendix E, Section IV.A.2.b} The staff finds that the VCSNS Emergency Plan provides an adequate description of the onsite emergency organization of plant staff personnel for all shifts and its relation to the responsibilities and duties of the normal staff complement. This is acceptable because it meets the requirements of Appendix E to 10 CFR Part 50 and conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.2.4 Designation of an Emergency Coordinator

Technical Information in the Emergency Plan: [B.2] Section 2.B.2, "Authority over the Emergency Response Organization," of the VCSNS Emergency Plan states the IED (Shift Supervisor from affected unit) or ED has overall authority and responsibility for coordinating all emergency response activities at the VCSNS. The Unit 1 Shift Supervisor will be designated as the IED if multiple units simultaneously enter an emergency or an emergency that affects the entire site occurs. The IED assumes control until relieved by on-call ERO members in the EOF

or by the Emergency Plant Operations Supervisor (EPOS). The ED will assume responsibility for the emergency response effort once the EOF has attained minimum staffing.

Technical Evaluation: [B.2] The staff finds that the VCSNS Emergency Plan adequately identifies a designated individual as emergency coordinator, who shall be on shift at all times, and who shall have the authority and responsibility to immediately and unilaterally initiate any emergency actions, including providing protective action recommendations to authorities responsible for implementing offsite emergency measures. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.2.5 Line of Succession for the Emergency Coordinator

Technical Information in the Emergency Plan: [B.3] Section 2.B.3, "Criteria for Assuming Command and Control (Succession)," of the VCSNS Emergency Plan states the IED has the authority and responsibility for emergency response until relieved by the ED. The Emergency Plant Manager (EPM) in the ERO will relieve the IED and is responsible for continued assessment of the emergency and functions of the ERO, but does not assume the ED's duties. Overall authority is transferred directly to the ED as soon as possible. The control room is relieved of responsibility after the declaration of an "alert" or higher, by the EPOS prior to transfer to the ED. Authority does not transfer to the EOF until adequate staff is present and have been fully briefed; status of the plant is well understood by the relieving individual; and transfer of authority from IED to ED has been made. The ED may alter the ERO if necessary.

Technical Evaluation: [B.3] The staff finds that the VCSNS Emergency Plan adequately identifies a line of succession for the emergency coordinator position, and identifies the specific conditions for higher level utility officials assuming this function. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.2.6 Responsibilities of the Emergency Coordinator

Technical Information in the Emergency Plan: [B.4] {Appendix E, Section IV.A.2.c} Section 2.B.4, "Non-Delegable Duties," of the VCSNS Emergency Plan lists those duties that may not be delegated to other elements of the emergency organization. These duties include event classification; making PARs for the general public; notification of offsite authorities; and approving company press releases pertaining to the emergency. The IED is responsible for the initial classification of the event and performing non-delegable duties until relieved by the EPOS or the ED. The ED will assume all non-delegable responsibilities from the EPOS or the IED.

{Appendix E, Section IV.A.2.a} Section 2.B.1, "On-Shift Emergency Response Organization Assignments," of the VCSNS Emergency Plan discusses the normal plant personnel complement. Table 2-1, "V.C. Summer ERO On-shift Staffing," and Table B-1a, "Shift Emergency Response Organization," of each unit annex, outlines the unit on-shift emergency organization and its relation to the normal staff complement. Section 2.B.5.a, "Onsite ERO," discusses the responsibilities of each position during an emergency.

Technical Evaluation: [B.4] {Appendix E, Section IV.A.2.c} The staff finds that the VCSNS Emergency Plan adequately establishes the functional responsibilities assigned to the emergency coordinator, and clearly specifies which responsibilities may not be delegated to other elements of the emergency organization. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and it meets the requirements in Appendix E to 10 CFR Part 50.

{Appendix E, Section IV.A.2.a} The staff finds that the VCSNS Emergency Plan adequately describes the onsite ERO with a detailed discussion of the authorities, responsibilities, and duties of the individual(s) who will take charge during an emergency. This is acceptable because it meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.2.7 On-shift and Augmentation Emergency Response Staff

Technical Information in the Emergency Plan: [B.5] Interrelationships of the overall ERO are diagramed in Figure B-1a, "Overall ERO Command Structure." Activities performed by the onsite ERO are listed. The onsite ERO functions under the direction of the EPM. On-call ERO personnel are immediately available during normal working hours within 75 minutes because they are working onsite performing regular duties and functions. Responsibilities of individual position within the onsite ERO are described in Section 2.B.5.a, "Onsite ERO." Organization of the onsite ERO is diagramed in Figure B-1b, "On-site Emergency Response Organization." Table 2-1, "V.C. Summer ERO On-shift Staffing," and Table B-1a, "Shift Emergency Response Organization," of each unit annex, outlines the unit on-shift emergency organization and its relation to the normal staff complement. The staffing requirements for the ERO are provided in Table B-1b, "Staffing Requirements for the VCSNS ERO." The offsite ERO, headed by the Emergency Offsite Manager (EOM), is responsible for offsite activities that include supporting onsite activities and coordinating public information. Responsibilities of individual positions within the offsite ERO are described in Section 2.B.5.b, "Offsite ERO." Organization of the offsite ERO is diagramed in Figure B-1c, "Off-site Emergency Response Organization." The EPI, operating under the company spokesperson, is responsible for providing information to the public. The Emergency Public Information Office (EPIO) consists of corporate and station personnel involved with emergency response that will coordinate with offsite agencies. Responsibilities of individual positions within the EPI are described in Section 2.B.5.c, "EPI Organization." Organization of the EPI is diagramed in Figure B-1d, "Emergency Public Information Organization."

Technical Evaluation: [B.5] The staff finds that the VCSNS Emergency Plan specifies the positions or titles and major tasks to be performed by the persons to be assigned to the functional areas of emergency activity. For emergency situations, specific assignments were made for all shifts and for plant staff members, both onsite and away from the site. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.2.8 Interfaces Between Functional Areas

Technical Information in the Emergency Plan: [B.6] Section 2.B.6, "Emergency Response Organization Block Diagram," of the VCSNS Emergency Plan states that Table B-1a, "Shift Emergency Response Organization," of each unit annex and Table B-1b, "Staffing Requirements for the VCSNS ERO," lists the key positions of the ERO and the supporting positions assigned to interface with Federal, State, and county/local authorities. Figure B-1a, "Overall ERO Command Structure," illustrates the interrelationships of the overall ERO organization. Figure B-1b, "On-site Emergency Response Organization," through Figure B-1d, "Emergency Public Information Organization" illustrates the interrelationships within the individual organizations. Figure B-1b includes the TSC, OSC, and EOF. Specific responsibilities and the interrelationships are discussed in detail in Section 2.B.5, "Emergency Response Organization Positional Responsibilities."

Technical Evaluation: [B.6] The staff finds that the VCSNS Emergency Plan adequately specifies the interfaces between and among the onsite functional areas of emergency activity, licensee headquarters support, local services support, and State and local government response organization. The interfaces were illustrated in a block diagram, and included the onsite TSC, OSC, and the applicant's EOF. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.2.9 Corporate Support

Technical Information in the Emergency Plan: [B.7] {Appendix E, Section IV.A.3} Sections 2.B.5.a, "Onsite ERO," Section 2.B.5.b, "Offsite ERO," and Section 2.B.5.c, "EPI Organization," of the VCSNS Emergency Plan describe who in corporate management, administrative, and technical support will augment the plant staff during emergency incidents in the following areas:

a) logistics support for emergency personnel (e.g., transportation, communications, temporary quarters, food and water, sanitary facilities in the field, and special equipment and supplies procurement)

b) technical support for planning and re-entry/recovery operations

c) management level interface with governmental authorities

d) release of information to news media during an emergency (coordinated with governmental authorities)

Technical Evaluation: {B.7} {Appendix E, Section IV.A.3} The staff finds that the VCSNS Emergency Plan adequately describes who in the corporate management, administrative, and technical support personnel will augment the plant staff during emergency events. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and the requirements of Appendix E to 10 CFR Part 50.

13.3C.2.10 Contractor and Private Organizations Support

Technical Information in the Emergency Plan: [B.8] {Appendix E, Section IV.A.5} Section 2.B.7, "Industry/Private Support Organizations," of the VCSNS Emergency Plan states VCSNS retains contractors to provide supporting services. Services are currently provided by Institute of Nuclear Power Operations (INPO), American Nuclear Insurers (ANI), DOE Radiation Emergency Assistance Center/Training Site (REAC/TS), and Manufacturer Design and Engineering Support.

Sections 2.B.5.a, "Onsite ERO," Section 2.B.5.b, "Offsite ERO," and Section 2.B.5.c, "EPI Organization," of the VCSNS Emergency Plan details licensee employees with special qualifications for coping with emergency conditions. Section 2.B.7, "Industry/Private Support Organizations" discusses contractors that will be providing assistance during emergencies. Section 2.B.8, "Supplemental Emergency Assistance to the ERO" addresses outside organizations that provide support services and the special qualifications of those persons were described.

Technical Evaluation: [B.8] {Appendix E, Section IV.A.5} The staff finds that the VCSNS Emergency Plan adequately specifies the contractor and private organizations that may be

requested to provide technical assistance to, and augmentation of, the emergency organization. The staff also finds that the VCSNS Emergency Plan adequately identifies, by position and function to be performed, other employees of the licensee with special qualifications for coping with emergency conditions that may arise or other persons with special qualifications, such as consultants, who are not employees of the licensee, and who may be called upon for assistance for emergencies. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.2.11 Local Emergency Response Support

Technical Information in the Emergency Plan: [B.9] {Appendix E, Section IV.A.6} Section 2.B.8, "Supplemental Emergency Assistance to the ERO," of the VCSNS Emergency Plan states that VCSNS maintains agreements with outside agencies that will provide assistance when called on during an emergency or during the recovery phase. Agreements identify the emergency measures to be provided, the criteria for implementation, and the arrangements for exchange of information. Names of support agencies are provided in Appendix 2, "Letters of Agreement." Services to be provided include: law enforcement; fire protection; ambulance services; medical and hospital support; transportation and treatment of injured station personnel. The applicant provided for transportation and treatment of injured personnel who may also be contaminated. Copies of the arrangements and agreements reached with contractor, private, and local support agencies were appended to the plan. The agreements delineated the authorities, responsibilities, and limits on the actions of the contractor, private organization, and local services support groups. Additional information on transportation and treatment of injured station personnel is described in Section 2.L, "Medical and Public Health Support."

Technical Evaluation: [B.9] {Appendix E, Section IV.A.6} The staff finds that the VCSNS Emergency Plan adequately identified the services to be provided by local agencies for handling emergencies (e.g., police, ambulance, medical, hospital, and fire-fighting organizations). The staff also finds that the VCSNS Emergency Plan adequately incorporates information about the emergency response roles of supporting organizations and offsite agencies. The information in the onsite emergency plan is sufficient to provide assurance of coordination among the supporting groups and with the licensee. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.2.12 Conclusions

On the basis of its review of the onsite emergency plan as described above for onsite emergency organization, the NRC staff concludes that the information provided in the VCSNS Emergency Plan is acceptable and meets the requirements of 10 CFR 50.47(b)(2) because it complies with the guidance in Planning Standard B of NUREG-0654/FEMA-REP-1 and the applicable portions of Appendix E to 10 CFR Part 50 as described above.

13.3C.3 Emergency Response Support and Resources

13.3C.3.1 Regulatory Basis

In determining whether the proposed emergency plan met the applicable regulatory requirements in 10 CFR 50.47(b)(3), the staff evaluated it against the detailed evaluation criteria in NUREG-0654/FEMA-REP-1. The staff also evaluated the proposed emergency plan against

applicable regulatory requirements related to the area of "Emergency Response Support and Resources," in Appendix E to 10 CFR Part 50.

13.3C.3.2 Person Authorized to Request Federal Support

Technical Information in the Emergency Plan: [C.1.a] Section 2.B.5.a, “Emergency Response Organization Positional Responsibilities,” states that the shift supervisor will become the ED and is responsible for notifying offsite support government agencies. The ED is responsible for requesting assistance from non-VCSNS EROs.

Technical Evaluation: [C.1.a] The staff finds that the VCSNS Emergency Plan adequately addresses the person authorized to request federal support. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.3.3 Expected Assistance from State, Local, and Federal Agencies

Technical Information in the Emergency Plan: [C.1.b] {Appendix E, Section IV.A.7} Section 2.A, “Assignment of Responsibility,” of the VCSNS Emergency Plan details the interactions with Federal, State, and local organizations that will be providing assistance in an emergency and their responsibilities. Resources from Federal agencies will be made available in an expeditious and timely manner. Section 2.C, “Emergency Response Support and Resources,” and Section 2.C.1, “Federal Response Support and Resources,” of the VCSNS Emergency Plan states assistance from Federal agencies is provided through the National Response Framework (NRF) with the NRC as the lead agency.

Technical Evaluation: [C.1.b] {Appendix E, Section IV.A.7} The staff finds that the VCSNS Emergency Plan adequately identifies the assistance expected from appropriate State, local, and Federal agencies with responsibilities for coping with emergencies. This is acceptable because it meets the requirements in Appendix E to 10 CFR Part 50 and it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.3.4 Resources to Support the Federal Response

Technical Information in the Emergency Plan: [C.1.c] Section 2.C.1.c, “Federal Response Support and Resources,” of the VCSNS Emergency Plan states emergency facilities have sufficient equipment and communication capabilities to accommodate Federal representatives. Working areas are provided for their use. Accommodations for response team members in each facility provided, are based on the NRC Response Coordination Manual 1996 (RCM-96) or NUREG-0728, “NRC Incident Response Plan.” In RAI 13.3-18(B), the staff requested additional information regarding specific resources made available to Federal response teams. In its response, the applicant committed to revise Section 2.C.1 of the VCSNS Emergency Plan to read as follows:

> d. Communication pathways provided in each of these facilities include access to dedicated landline telephones, wireless telephones and FTS telephones as provided by the NRC and include the Reactor Safety Counterpart Link (RSCL), Management Counterpart Link (MCL), the Protective Measures Counterpart Link (PMCL), and the Local Area Network (LAN). These FTS lines are in place in the appropriate VCSNS emergency response facilities and are for use by the NRC Response Team upon their arrival. The VCSNS ERO does not normally utilize these communication links.

Technical Evaluation: [C.1.c] The staff finds the additional information and textual revisions submitted in response to RAI 13.3-18(B) to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1 and confirmed that Revision 1 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-18(B). The staff finds that the VCSNS Emergency Plan adequately describes provisions for incorporating the Federal response capability into its operation plan; including specific licensee, State and local resources available to support the Federal response. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.3.5 Representatives to Offsite Governments

Technical Information in the Emergency Plan: [C.2.b] Section 2.C.2.b, "Liaisons," of the VCSNS Emergency Plan states site personnel are assigned as technical liaisons to the State of South Carolina and the emergency operation centers (EOCs) of surrounding counties when they are activated. They are responsible for interpreting EALs, explaining accident conditions, and providing technical information regarding the affected unit's actions by the station's ERO.

Technical Evaluation: [C.2.b] The staff finds that the VCSNS Emergency Plan adequately addresses the dispatch of a representative to principal offsite governmental EOCs. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.3.6 Radiological Laboratory Support

Technical Information in the Emergency Plan: [C.3] Section 2.C.3, "Radiological Laboratories," of the VCSNS Emergency Plan states the onsite laboratory includes equipment for chemical analyses and for the analysis of radioactivity and is the central point for receipt and analysis of all onsite samples. Additional laboratory support can be available at the Department of Health and Environmental Control (DHEC) in approximately two to three hours. The DHEC also has a mobile laboratory for analyzing environmental samples.

Technical Evaluation: **[C.3]** The staff finds that the VCSNS Emergency Plan adequately identifies radiological laboratories and their general capabilities and expected availability to provide radiological monitoring and analyses services which can be used in an emergency. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.3.7 Other Sources of Assistance

Technical Information in the Emergency Plan: [C.4] Section 2.C.4, "Other Assistance," of the VCSNS Emergency Plan states other companies' operating nuclear facilities are available to provide assistance and support through the INPO. Facilities, organizations, and individuals, to provide support are listed in the Emergency Planning Telephone Directory. A general description of services is provided.

{Appendix E, Section III} Chapter 13, "Conduct of Operations," of the VCSNS FSAR describes the organization of the VCSNS site and outlines individual responsibilities. Section 2.A, "Assignment of Responsibility," of the VCSNS Emergency Plan describes the primary responsibilities and organizational control of SCE&G, Federal, State, county, and other support organizations. A block diagram outlining the interrelationships of supporting organizations is provided in Figure A-1, "Agency Response Organization Interrelationships." A

list of Letters of Agreement is provided in Appendix 2, “Letters of Agreement.” These LOAs formalize the coordination of the response.

Technical Evaluation: [C.4] The staff finds that the VCSNS Emergency Plan adequately identifies the other sources of assistance expected to support any emergency response. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

{Appendix E, Section III} The staff finds that the VCSNS Emergency Plan adequately describes the applicant’s operational role, its concept of operations, and its relationship to the total effort. This is acceptable because it meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.3.8 Conclusions

On the basis of its review of the onsite emergency plan as described above for the emergency response support and resources, the NRC staff concludes that the information provided in the VCSNS Emergency Plan is acceptable and meets the requirements of 10 CFR 50.47(b)(3) because it complies with the guidance in Planning Standard C of NUREG-0654/FEMA-REP-1 and the applicable portions of Appendix E to 10 CFR Part 50 as described above.

13.3C.4 Emergency Classification System

13.3C.4.1 Regulatory Basis

In determining whether the proposed emergency plan met the applicable regulatory requirements in 10 CFR 50.47(b)(4) for the emergency classification system, the staff evaluated it against the detailed evaluation criteria in NUREG-0654/FEMA-REP-1. The staff also evaluated the proposed emergency plan against applicable regulatory requirements related to the area of "Emergency Classification System," in Appendix E to 10 CFR Part 50.

13.3C.4.2 Emergency Classification System

Technical Information in the Emergency Plan: [D.1 and D.2] {Appendix E, Section IV.B} {Appendix E, Section IV.C} Section 2.D, "Emergency Classification System," of the VCSNS Emergency Plan states that for the VCSNS Emergency Plan, the initiating conditions (ICs) include the conditions provided in NEI 07-01, as it applies to AP1000 facilities and postulated accidents identified in the FSAR. Section 3, "Classification of Emergencies,” of each annex for Units 2 and 3 of the VCSNS Emergency Plan provides the parameter values and equipment status that are indicative of each emergency class. The applicant also proposed EP ITAAC 1.1, which states that the specific parameters identified in Section 3 of each units annex have been retrieved and displayed in the control room, TSC, and EOF. The proposed EP ITAAC 1.1 states that the ranges available in the control room, TSC, and EOF encompassed the values for the specific parameters identified in the EALs in Section 3 of each unit’s appendix of the VCSNS Emergency Plan. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

In RAIs 13.3-31 and 13.3-41, the staff requested that the applicant address its plans to finalize the required EAL scheme. In its response, the applicant provided a revised Section 2.D, and proposed a license condition to submit a fully developed set of site-specific EALs in accordance with the NRC-endorsed version of NEI 07-01 with no deviations. The applicant has proposed

License Condition 11 in Part 10, “Proposed License Conditions and ITAAC,” related to the emergency classification scheme. Specifically, the applicant proposed the following:

> The licensee shall submit a fully developed set of plant-specific Emergency Action Levels (EALs) for VCSNS Units 2 and 3 in accordance with NEI-07-01 Revision 0. These fully developed EALs shall be submitted to the NRC for confirmation at least 180 days prior to initial fuel load. The submitted EALs will be written with no deviations.

Technical Evaluation: [D.1 and D.2] {Appendix E, Section IV.B} {Appendix E, Section IV.C} The staff finds Section 2.D of the VCSNS Emergency Plan, as revised by RAI 13.3-31 adequate because the applicant’s proposed overview of its EAL scheme and its general list of licensee actions at each emergency classification level and its commitment to control the EALs by 10 CFR 50.54(q) meets the requirements of Appendix E to 10 CFR Part 50 and because it conforms to the guidance in NUREG-0654/FEMA-REP-1. In a letter dated August 12, 2009, the NRC found the NEI 07-01 EAL scheme acceptable for development of the EAL scheme.

The staff has reviewed proposed License Condition 11 and finds that it does not include the review of the EALs to be discussed and agreed upon with the State and local officials as required by Appendix E, Section IV.B. Therefore, the staff has revised the proposed license condition as follows:

> The licensee shall submit a fully developed set of plant-specific Emergency Action Levels (EALs) for VCSNS Units 2 and 3 in accordance with NEI-07-01 Revision 0. <u>The EALs shall have been discussed and agreed upon with State and local officials.</u> These fully developed EALs shall be submitted to the NRC for confirmation at least 180 days prior to initial fuel load. The submitted EALs will be written with no deviations.

The proposed EAL scheme and license condition as modified by the staff are acceptable because they meet the requirements of Appendix E to 10 CFR Part 50 and conforms to the guidance provided in NUREG-0654/FEMA-REP-1.

13.3C.4.3 Emergency Action Levels Review by State and Local Authorities

Technical Information in the Emergency Plan: {Appendix E, Section IV.B} Letters of Certification with State and local governments are included in Appendix 2, "Letters of Agreement," of the VCSNS Emergency Plan. These letters state that the signature on the letter indicates that the parties concurred with the emergency classification system for VCSNS. The VCSNS Emergency Plan states that the EALs will be reviewed on an annual basis. The State and counties are informed regarding any EAL changes that significantly impact the ICs or Technical Basis.

Technical Evaluation: {Appendix E, Section IV.B} The staff finds that the VCSNS Emergency Plan provides for the annual review of EALs by State and local officials. This is acceptable because it meets the requirements of Appendix E, Section IV.B to 10 CFR Part 50 and conforms to the guidance provided in NUREG-0654/FEMA-REP-1.

13.3C.4.4 Conclusions

On the basis of its review of the VCSNS Emergency Plan as described above for the emergency classification system, the NRC staff concludes that the information provided in the VCSNS Emergency Plan is acceptable and meets the requirements of 10 CFR 50.47(b)(4) because it complies with the guidance in Planning Standard D of NUREG-0654/FEMA-REP-1 and the applicable portions of Appendix E to 10 CFR Part 50 as described above.

13.3C.5 Notification Methods and Procedures

13.3C.5.1 Regulatory Basis

In determining whether the proposed emergency plan met the applicable regulatory requirements in 10 CFR 50.47(b)(5) for notification methods and procedures, the staff evaluated it against the detailed evaluation criteria in NUREG-0654/FEMA-REP-1. The staff also evaluated the proposed emergency plan against applicable regulatory requirements related to the area of "Notification Methods and Procedures," in Appendix E to 10 CFR Part 50 and 10 CFR 50.72, “Immediate notification requirements for operating nuclear power reactors.”[17]

13.3C.5.2 Notification Procedures, Capabilities, and Agreements

Technical Information in the Emergency Plan: [E.1] {Appendix E, Section IV.D.1 and D.3} Section 2.E.1, “Bases for Emergency Response Organization Notification,” of the VCSNS Emergency Plan states that in cooperation with State and county authorities VCSNS has established mutually agreeable methods and procedures for notification of offsite response organizations consistent with the emergency classification and action level scheme. Notifications include a means of verification or authentication such as the use of dedicated communications networks, verification code words, or providing call-back verification phone numbers. Appendix 3, “Procedure Cross-Reference to the Emergency Plan,” identified “Notification” as the implementing procedure that will address methods and procedures for notifying offsite EROs. The applicant has proposed EP ITAAC 2.1 to test the capabilities of the system used to notify State and local authorities. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [E.1] {Appendix E, Section IV.D.1 and D.3} The staff finds that the VCSNS Emergency Plan adequately refers to procedures which describe mutually agreeable bases for notification of response organizations and conforms to the emergency classifications as set forth in Appendix 1, “US Nuclear Regulatory Commission Emergency Action Level Guidelines for Nuclear Power Plants,” to NUREG-0654/FEMA-REP-1. These procedures include the means for verification of messages. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.5.3 Notification and Activation of the Emergency Response Organization

Technical Information in the Emergency Plan: **[E.2] {Appendix E, Section IV.C}** Section 2.E.2, “Notification and Mobilization of Emergency Response Personnel,” provides a summary of the methods used to notify the ERO. Section 2.E.2 also states that procedures are established for notification and mobilizing emergency response personnel. Appendix 3,

[17] Parentheses identify other applicable regulatory requirements

"Procedure Cross-Reference to the Emergency Plan," identified "Notification" as the implementing procedure that will address methods and procedures for notifying and activating the onsite ERO. The applicant has proposed EP ITAAC 2.2 to test the capabilities of the system used to notify licensee response organizations and their mobilization procedures. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [E.2] {Appendix E, Section IV.C} The staff finds that the VCSNS Emergency Plan adequately addresses procedures for alerting, notifying, and mobilizing emergency response personnel. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.5.4 Initial Message Content to Offsite Response Organizations

Technical Information in the Emergency Plan: [E.3] {Appendix E, Section IV.A.4 and IV.C} Section 2.E.3, "Initial Notification Messages," of the VCSNS Emergency Plan states that the VCSNS and the State and local authorities have established the contents of the initial message form that includes as a part of the message form content: event classification; whether a release is taking place; potentially affected subareas when a "general emergency" is declared; and whether offsite protective measures may be necessary. The applicant has proposed EP ITAAC 2.3 to test the capabilities to inform the public in the plume exposure pathway EPZ. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [E.3] {Appendix E, Section IV.A.4 and IV.C} The staff finds that the VCSNS Emergency Plan, in conjunction with State and local organizations, adequately establishes the contents of the initial emergency messages to be sent from the plant. These messages include information about the class of emergency, whether a release is taking place, potentially affected population and areas, and whether protective measures may be necessary. This is acceptable because it meets the requirements of Appendix E, to 10 CFR Part 50 and conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.5.5 Follow-up Messages to Offsite Response Organizations

Technical Information in the Emergency Plan: [E.4] Section 2.E.4, "Follow-Up Messages," of the VCSNS Emergency Plan states that updates are provided on a prearranged frequency and include prearranged information plus information requested at the time of notification. Follow-up messages are provided to the NRC Operations Center as soon as possible, but not later than one hour after significant new information is available. The information provided may include any or all of the information specified in NUREG-0654/FEMA-REP-1, Evaluation Criterion E.4.a-n, based upon the type of incident, needs of the affected agencies, and information requested. Implementing Procedures will be developed to address specific follow-up message format.

Technical Evaluation: [E.4] The staff finds that the VCSNS Emergency Plan adequately provides for follow-up messages from the facility to offsite authorities. The staff verified that the nature of the information provided is consistent with the State and local emergency plans. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.5.6 Notification of the Public

Technical Information in the Emergency Plan: [E.6] Section 2.E.6, "Notification of the Public," of the VCSNS Emergency Plan states that prompt notification to the general public

within the 10-mile plume exposure pathway EPZ consists of two principle elements, fixed sirens (Alert and Notification Systems (ANS)) and the Emergency Alert System (EAS) radio stations. The VCSNS personnel will activate the ANS upon direction by state or local authorities as specified in agreements. The applicant proposed EP ITAAC Acceptance Criteria 2.3 to confirm the means to notify and provide instructions to the populace in the plume exposure pathway EPZ. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [E.6] The staff finds that the VCSNS Emergency Plan adequately establishes administrative and physical means, and the time required for notifying and providing prompt instructions to the public in the plume exposure pathway EPZ. This is acceptable because it conforms to the guidance of NUREG-0654/FEMA-REP-1.

13.3C.5.7 Written Messages to the Public

Technical Information in the Emergency Plan: [E.7] Section 2.E.7, "Messages to the Public," of the VCSNS Emergency Plan states that VCSNS will provide message content support when requested. The state has developed public EAS messages based on the classification scheme. Appendix 2, Annex C, "Sample Emergency Alert System Message," of the South Carolina Operational Radiological Emergency Response Plan includes sample EAS messages with content for sheltering and evacuation and refers to information in the safety information brochure/calendar. The messages included the appropriate aspects of sheltering, and ad hoc respiratory protection.

Technical Evaluation: [E.7] The staff finds the VCSNS Emergency Plan adequately discusses written messages intended for the public developed by the State of South Carolina. In particular, draft messages to the public giving instructions with regard to specific protective actions to be taken by occupants of affected areas, were prepared. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.5.8 Notification of the NRC

Technical Information in the Emergency Plan: {Appendix E, Section IV.A.4} (10 CFR 50.72(a)(3)) and (10 CFR 50.72(c)(3)) Section 2.E.2.b.2, "NRC," of the VCSNS Emergency Plan states that the NRC will be notified immediately after appropriate State and county agencies, but not later than one hour after the time of initial classification, escalation, termination, or entry into the Recovery Phase. Section 2.E.2.b.2 also states that VCSNS will use a Nuclear Power Plant Emergency Notification Form (NPPENF) as a guide to provide the initial information and a communications log will be maintained if continuous communications is requested and established.

Technical Evaluation: {Appendix E, Section IV.A.4} (10 CFR 50.72(a)(3)) The staff finds that the VCSNS Emergency Plan states that the licensee will notify the NRC immediately after notification of the appropriate State or local agencies and not later than one hour after the time the licensee declares one of the emergency classes. This is acceptable because it meets the requirements in 10 CFR 50.72(a)(3) and Appendix E to 10 CFR Part 50.

(10 CFR 50.72(c)(3)) The staff finds that the VCSNS Emergency Plan states that with respect to the telephone notifications made under 10 CFR 50.73(a) and (b), in addition to making the required initial notification, adequate provisions have been made that upon request of the NRC

an open and continuous communication channel with the NRC will be maintained. This is acceptable because it meets the requirements in 10 CFR 50.72(c)(3).

13.3C.5.9 Conclusions

The NRC staff concludes that the information provided in the VCSNS Emergency Plan regarding notification methods and procedures is acceptable and meets the requirements of 10 CFR 50.47(b)(5) because it complies with the guidance in Planning Standard E of NUREG-0654/FEMA-REP-1, the applicable portions of Appendix E to 10 CFR Part 50, and the requirements of 10 CFR 50.72(a)(3) and (c)(3) as described above.

13.3C.6 Emergency Communications

13.3C.6.1 Regulatory Basis

In determining whether the proposed emergency plan met the applicable regulatory requirements in 10 CFR 50.47(b)(6) for emergency communications, the staff evaluated it against the detailed evaluation criteria in NUREG-0654/FEMA-REP-1. The staff also evaluated the proposed emergency plan against applicable regulatory requirements related to the area of "Emergency Communications," in Appendix E to 10 CFR Part 50 and Generic Letter (GL) 91-14, “Emergency Telecommunications.”

13.3C.6.2 Content of the Emergency Communications Plan

Technical Information in the Plan: [F.1.a] Section 2.F.1, “Communications/Notifications,” of the VCSNS Emergency Plan states that VCSNS has an offsite notification system, the ESSX that provides 24-hour communications to state and county warning points within the plume exposure pathway EPZ, which are continuously staffed. The ESSX is backed up with facsimile, commercial telephone lines, radios, and internet links.

Technical Evaluation: [F.1.a] The staff finds that the VCSNS Emergency Plan adequately addresses communication plans for emergencies, provides for 24-hour per day notification to and activation of the State/local emergency response network, and at a minimum, a telephone link and alternate, including 24-hour per day manning of communications links that initiate emergency response actions. These actions are acceptable because they conform to the guidance described in NUREG-0654/FEMA-REP-1. Additional information on Emergency Communications is located in SER Section 9.5.2, “Communications Systems.”

Technical Information in the Plan [F.1.b] Section 2.F.1, “Communications/Notifications,” of the VCSNS Emergency Plan states that ESSX provides 24-hour communications to state and county warning points within the plume exposure pathway EPZ. Backup systems to the ESSX are available. In RAI 13.3-20(A), the staff requested that the applicant clarify whether the ESSX is available in the TSC. In its response, the applicant committed to revise Section 2.F.1.d.1 of the VCSNS Emergency Plan to correctly identify the ESSX line as being available in the TSC.

Technical Evaluation: [F.1.b] The staff finds the additional information and textual revision submitted in response to RAI 13.3-20(A) to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 1 of the VCSNS Emergency Plan included the additional information and textual revisions provided in the response to RAI 13.3-20(A). Therefore, the staff finds that the VCSNS Emergency Plan

adequately addresses provisions for communications with State and local governments within the EPZs. This is acceptable because it meets the guidance in NUREG-0654/FEMA-REP-1.

Technical Information in the Plan: [F.1.c] Section 2.F.1.f, "NRC Communications (ENS and HPN)," of the VCSNS Emergency Plan states that the Emergency Notification System (ENS), the Health Physics Network (HPN) or commercial and satellite telephone lines are used to communicate with the NRC. Section 2.F.1, "Communications/Notifications," states that Figure F-1, "Notification Scheme (After Full Augmentation)," depicts initial notification paths and organizational titles from VCSNS to Federal, State, and county EROs and supporting industry agencies.

Technical Evaluation: [F.1.c] The staff finds that the VCSNS Emergency Plan adequately addresses provisions for communications as needed with Federal emergency response organizations. This is acceptable because it conforms to the guidance described in NUREG-0654/FEMA-REP-1.

Technical Information in the Plan: [F.1.d] Section 2.F.1, "Communications/Notifications," of the VCSNS Emergency Plan states the ESSX provides 24-hour communications to State and county warning points within the plume exposure pathway EPZ, which are continuously staffed. The ESSX is backed up with facsimile, commercial telephone lines, radios and internet. Field monitoring communications is conducted by a separate radio communication channel with commercial cell phones and satellite phones as backup. Communications are between the affected unit control room, EOF and mobile units. The applicant proposed EP ITAAC Program Element 3.1 to test the capabilities to verify that the means exist for communications among the control room, TSC, EOF, principal State and local EOCs and radiological field assessment teams. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [F.1.d] The staff finds the VCSNS Emergency Plan adequately describes the communication plans that included provisions for emergency communications between the nuclear facility and the EOF, State and local EOCs, and radiological monitoring teams. This is acceptable because it conforms to the guidance described in NUREG-0654/FEMA-REP-1.

Technical Information in the Plan [F.1.e] Section 2.F.1.e, "ERO Notification System," of the VCSNS Emergency Plan states ERO members are rapidly notified using pagers as primary and an automated telephone system as a backup notification system. The notification system is designed with redundant power. Appendix 3 identifies procedures that will be implemented should the notification system fail.

Technical Evaluation: [F.1.e] The staff finds that the VCSNS Emergency Plan adequately describes the emergency communication plans that include provision for alerting or activating emergency personnel in each response organization. This is acceptable because it conforms to the guidance provided in NUREG-0654/FEMA-REP-1.

Technical Information in the Plan: [F.1.f] Figure F-1, "Notification Scheme (After Full Augmentation)," of the VCSNS Emergency Plan identifies the ENS/HPN Communicator and the TSC Manager within the TSC, as having responsibility for communications to the NRC Headquarters Duty Officer and the EOF HPN Communicator. Section 2.F, "Emergency Communications," identifies communications between the control room/TSC/EOF to the NRC Operations Center via the ENS or private telephone and to the regional office via the normal

private capability. Communication between the TSC/EOF and offsite monitoring teams is by radio. The applicant has proposed EP ITAAC Program Element 3.2 to test the communications capabilities of the ERFs to NRC headquarters and regional offices. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [F.1.f] The staff finds that the VCSNS Emergency Plan adequately describes the communication plans for emergencies and addresses provisions for communication by the licensee with NRC headquarters and NRC Regional Office EOCs and the EOF and radiological monitoring team assembly area. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

Technical Information in the Plan: {Appendix E, Section IV.E.9} Section 2.F.1, "Communications/Notifications," of the VCSNS Emergency Plan states the ESSX provides 24-hour communications to State and county warning points within the plume exposure pathway EPZ, which are continuously staffed. The local commercial telephone system vendor provides primary and secondary power at its location. The ERO notification system is used for rapid notification of VCSNS ERO members and is designed with redundant power. Backup power is also available for the ENS and the HPN. Additional information concerning communications systems and backup power can be found in AP1000 DCD Section 9.5.2, "Communication System."

Technical Information in the Plan: {Appendix E, Section IV.E.9(a)} Figure F-1, "Notification Scheme (After Full Augmentation)," of the VCSNS Emergency Plan identifies the ENS/HPN Communicator and the TSC Manager, as having responsibility for communications to the NRC Headquarters Duty Officer and the EOF HPN Communicator. In addition, the affected unit control room Shift Supervisor or EPOS is responsible for initial notification to State and county warning points/EOC Dispatcher/Communicator. After activation of the VCSNS EOF, the State/County Communicator provides updates to the State and county warning points. Section 2.F.3, "Communications Testing," and Section 2.N.2.a, "Communications Drills," states that monthly drills are conducted with State and local government warning points and EOCs.

Technical Information in the Plan: {Appendix E, Section IV.E.9(b)} Section 2.F.1, "Communications/Notifications," of the VCSNS Emergency Plan, states that Figure F-1, "Notification Scheme (After Full Augmentation)," depicts initial notification paths and organizational titles from VCSNS to Federal, State, and county EROs, and supporting industry agencies. Section 2.F.3, "Communications Testing," and Section 2.N.2.a, "Communications Drills," states that annual drills are conducted to fully test the emergency communications systems outlined in Section 2.F.

Technical Information in the Plan: {Appendix E, Section IV.E.9(c)} Section 2.F.3, "Communications Testing," and Section 2.N.2.a, "Communications Drills," of the VCSNS Emergency Plan states that annual drills are conducted to fully test the emergency communications systems outlined in Section F. Section 2.N.2.a also states that communication among the control room, TSC, State and local EOCs, field monitoring teams, OSC, EOF, and the joint information center (JIC) are included in the annual drill.

Technical Information in the Plan: {Appendix E, Section IV.E.9(d)} Section 2.F.3, "Communications Testing," and Section N.2.a, "Communications Drills," of the VCSNS Emergency Plan, states that monthly drills are conducted to demonstrate the capability to notify the NRC using the ENS. Figure F-3, "NRC Communications for Nuclear Response," shows

communication flow between the affected unit control room, TSC, and EOF to the NRC Headquarters and NRC Region.

Technical Evaluation: {Appendix E, Section IV.E.9} The staff finds that the VCSNS Emergency Plan adequately states that at least one onsite and one offsite communications systems exists, and that each system has a backup power source. This is acceptable because it meets the requirements described in Appendix E to 10 CFR Part 50.

In addition, the applicant's communication plans have arrangements for emergencies, including titles and alternates for those in charge at both ends of the communication links and the primary and backup means of communication. Consistent with the function of the governmental agency, these arrangements included:

a. Provisions for communications with contiguous State/local governments within the plume exposure pathway EPZ. Such communications shall be tested monthly.

b. Provisions for communications with Federal EROs. Such communications systems shall be tested annually.

c. Provisions for communications among the nuclear power reactor control room, the onsite TSC, and the EOF; and among the nuclear facility, the principal State and local EOCs, and the field assessment teams. Such communications systems shall be tested annually.

d. Provisions for communications by the licensee with NRC Headquarters and the appropriate NRC Regional Office Operations Center from the nuclear power reactor control room, the onsite TSC, and the EOF. Such communications shall be tested monthly.

These provisions for onsite and offsite communications are acceptable because they meet the requirements in Appendix E to 10 CFR Part 50.

Technical Information in the Plan (GL 91-14) Appendix 1, "References," of the VCSNS Emergency Plan lists NRC Bulletin 80-15 and GL 91-14, which address RSCL, PMCL, MCL, communication paths. However, RSCL, PMCL, MCL, and the LAN were not specifically discussed in the VCSNS Emergency Plan. In RAI 13.3-20(B), the staff requested additional information on how VCSNS addressed RSCL, PMCL, MCL, and LAN communications paths. In its response, the applicant stated that these communication lines are reserved for use by the NRC Site Response Team, and VCSNS does not include utilization of these communication links in the Emergency Plan. In RAI 13.3-38, the staff requested that the applicant provide a statement with regard to use of RSCL, PMCL, MCL, and LAN communications paths in the VCSNS Emergency Plan or provide justification for why the statement is not needed. In its response, the applicant revised the text on page C-1 and Section 2.C.1.d to include the following statement:

> Communication pathways provided in each of these facilities include access to dedicated landline telephones, wireless telephones and [Federal Telecommunications System] FTS telephones as provided by the NRC and include the Reactor Safety Counterpart Link (RSCL), Management Counterpart Link (MCL), the Protective Measures Counterpart Link (PMCL), and the Local Area Network (LAN). These FTS lines are in place in the appropriate VCSNS

emergency response facilities and are for use by the NRC Response Team upon their arrival. The VCSNS ERO does not normally utilize these communication links.

Section 2.E.2.b.2, "NRC," identifies commercial and other dedicated telephone service and "any other method" as backup should the ENS fail. Section 2.F.1.f, "NRC Communications (ENS and HPN)," states backup power is provided for the ENS telephone equipment.

Technical Evaluation: (GL 91-14) The staff finds the additional information and textual revision submitted in response to RAIs 13.3-20(B) and 13.3-38 to be acceptable because they conform to the guidance in GL 91-14. The staff confirmed that Revision 2 of the VCSNS Emergency Plan included the additional information and textual revisions provided in the response to RAI 13.3-38. Therefore, the staff finds that the VCSNS Emergency Plan adequately includes provisions for communications with the NRC. This is acceptable because it meets the guidance in GL 91-14.

13.3C.6.3 Communications with Medical Facilities

Technical Information in the Plan: [F.2] Section 2.F.2, "Medical Communications," of the VCSNS Emergency Plan states that commercial telephones are used to communicate with primary and backup medical hospitals and transportation services. In RAI 13.3-20(C), the staff requested an explanation of backup communication systems should the commercial telephone system not be available. In its response, the applicant stated that satellite telephones will be used for back-up communication as discussed in Section 2.F.1.d.7.

Technical Evaluation: [F.2] The staff finds the clarification submitted in response to RAI 13.3-20(C) to be acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 1 of the VCSNS Emergency Plan included the additional information and textual revisions provided in the response to RAI 13.3-20(C). The staff finds that the VCSNS Emergency Plan adequately ensures that a coordinated communication link exists for fixed medical support facilities and ambulance service(s). This is acceptable because it conforms to the guidance described in NUREG-0654/FEMA-REP-1.

13.3C.6.4 Periodic Testing of the Emergency Communications System

Technical Information in the Plan: [F.3] Section 2.F.3, "Communications Testing," of the VCSNS Emergency Plan Communications equipment is checked in accordance with Section N.2. Communication drills between VCSNS and state and county government facilities are conducted in accordance with Section 2.N.2.a. In addition, minimum siren testing is performed as follows: silent tests of the ANS (sirens) are conducted at least biweekly; growl (or equipment) tests are conducted quarterly and following preventive maintenance and full volume tests are conducted annually.

Technical Evaluation: [F.3] The staff finds that the VCSNS Emergency Plan adequately describes the conduct of periodic testing of the entire emergency communications system. This is acceptable because it conforms to the guidance described in NUREG-0654/FEMA-REP-1.

13.3C.6.5 Conclusions

The NRC staff concludes that the information provided in the VCSNS Emergency Plan regarding emergency communications is acceptable and meets the requirements of 10 CFR 50.47(b)(6) because it complies with the guidance in Planning Standard F of NUREG-0654/FEMA-REP-1, the applicable portions of Appendix E to 10 CFR Part 50, and the guidance in GL 91-14 as described above.

13.3C.7 Public Education and Information

13.3C.7.1 Regulatory Basis

In determining whether the proposed emergency plan met the applicable regulatory requirements in 10 CFR 50.47(b)(7) for public education and information, the staff evaluated it against the detailed evaluation criteria in NUREG-0654/FEMA-REP-1. The staff also evaluated the proposed emergency plan against applicable regulatory requirements related to the area of "Public Education and Information," in Appendix E to 10 CFR Part 50.

13.3C.7.2 Content of Public Information

Technical Information in the Plan: [G.1] Section 2.G, “Public Education and Information,” of the VCSNS Emergency Plan provides a description of the site’s public education information program. The VCSNS site coordinates with State and county agencies to update the EPI publication annually. This information includes educational information on radiation, contact for additional information, protective measures (e.g., evacuation routes and relocation centers, sheltering, respiratory protection, radioprotective drugs, and special needs of the handicapped). The publication is distributed annually to all residents and transient locations, specified in Section 2.G.2, “Public Education Materials,” within the 10-mile plume exposure pathway EPZ.

Technical Evaluation: [G.1] The staff finds that the VCSNS Emergency Plan adequately provides for a coordinated periodic (at least annually) dissemination of information to the public regarding how they will be notified and what their actions should be in an emergency. Means for accomplishing this dissemination are also adequately described. This is acceptable because it conforms to the guidance provided in NUREG-0654/FEMA-REP-1.

13.3C.7.3 Dissemination and Maintenance of Public Information

Technical Information in the Plan: [G.2] {Appendix E, Section IV.D.2} Section 2.G, “Public Education and Information,” of the VCSNS Emergency Plan provides a description of the public education information program. The VCSNS site coordinates with State and county agencies to update the EPI publication annually. The publication is distributed annually to all residents and transient locations within the 10-mile plume exposure pathway EPZ. Section 2.G.2, “Public Education Materials,” of the VCSNS Emergency Plan states that information intended for transients is placed at local business establishments and at the entrances to recreational areas around the VCSNS site. Signs or other measures (e.g., decals, posted notices or other means, placed in hotels, motels, gasoline stations and phone booths) are used to disseminate to any transient population within the plume exposure pathway EPZ appropriate information that would be helpful if an emergency or accident occurs. Such notices refer the transient to the telephone directory or other source of local emergency information and guide the visitor to appropriate radio and television frequencies.

Technical Evaluation: [G.2] {Appendix E, Section IV.D.2} The staff finds that the VCSNS Emergency Plan adequately describes a public information program that provides the permanent and transient population within the plume exposure EPZ an opportunity to become aware of the information annually. The program includes provision for written material that is available in a residence during an emergency. This is acceptable because it conforms to the guidance described in NUREG-0654/FEMA-REP-1 and it meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.7.4 Points of Contact for the News Media

Technical Information in the Plan: [G.3.a] Section 2.G.3, "Media Accommodations," of the VCSNS Emergency Plan lists the EPI Organization and the JIC as the two organizations in charge of media and public relations. The SCANA Public Affairs Group is notified when an "unusual event" or higher emergency condition exists and will handle media responsibilities until the JIC is activated. The EPI is comprised of senior managers from SCANA who will function as company spokespersons. (Note: SCANA Corporation is an energy-based holding company that has SCE&G as one of its subsidiary companies.) Organization of the EPI is discussed in detail in Section 2.B.5.c, "EPI Organization." The EPI provides information from the ERO to the public, via the news media, after it is approved by the ED. The JIC is where approved news releases will be provided to the media for dissemination to the public. The JIC, located with the EOF, is equipped with appropriate seating, lighting, and visual aids to allow for public announcements and briefings to be given to the news media. The JIC is activated at the declaration of an "alert" or higher classification.

Technical Evaluation: [G.3.a] The staff finds that the VCSNS Emergency Plan adequately designates the points of contact and physical locations for use by news media during an emergency and that the VCSNS Emergency Plan also describes space, which may be used for a limited number of the news media at the EOF. This is acceptable because it conforms to the guidance provided in NUREG-0654/FEMA-REP-1.

13.3C.7.5 Space for News Media

Technical Information in the Plan: [G.3.b] Section 2.G.3.a.2, "Joint Information Center," of the VCSNS Emergency Plan states the JIC, co-located with the EOF, is where approved news releases will be provided to the media for dissemination to the public. The JIC is equipped with appropriate seating, lighting, and visual aids to allow for public announcements and briefings to be given to the news media. Section 2.H.3, "Joint Information Center," of the VCSNS Emergency Plan states the JIC also provides facilities and equipment for VCSNS staff, Federal, State, and county agencies to interface and where information regarding the event is released to the media and general public. The applicant has proposed EP ITAAC 4.1 to ensure that the licensee has provided space which may be used for a limited number of the news media. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [G.3.b] The staff finds that the VCSNS Emergency Plan adequately describes space which may be used for the news media at the emergency operations facility and is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.7.6 Designated Spokesperson

Technical Information in the Plan: [G.4.a] Section 2.G.3, "Media Accommodations," of the VCSNS Emergency Plan states that the Company Spokesperson will function as the single

point of contact to interface with Federal, State, and local authorities responsible for disseminating information to the public. Section 2.H.3, "Joint Information Center," of the VCSNS Emergency Plan states the Company Spokesperson will coordinate the release of information during an emergency from the JIC in the EOF.

Technical Evaluation: [G.4.a] The staff finds that the VCSNS Emergency Plan adequately identifies a spokesperson that has access to all necessary information. This is acceptable because it conforms to the guidance provided in NUREG-0654/FEMA-REP-1.

13.3C.7.7 Timely Exchange of Information

Technical Information in the Plan: [G.4.b] Section 2.G.4.b, "Coordination of Public Information," of the VCSNS Emergency Plan states that the JIC is staffed by Federal, State, county, and VCSNS personnel to assure timely, periodic exchange and coordination of information. The exchange of information is described in Section 2.G.3, "Media Accommodations."

Technical Evaluation: [G.4.b] The staff finds the VCSNS Emergency Plan adequately describes established arrangements for timely exchange of information among designated spokespersons. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.7.8 Rumor Control

Technical Information in the Plan: [G.4.c] Section 2.G.4.c, "Coordination of Public Information," of the VCSNS Emergency Plan states rumors or misinformation is identified by the media/rumor control monitors. This group will be responsible for responding to telephone calls and monitoring media reports.

Technical Evaluation: [G.4.c] The staff finds that the VCSNS Emergency Plan adequately describes coordinated arrangements for dealing with rumors. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.7.9 Annual Media Orientation

Technical Information in the Plan: [G.5] Section 2.G.5, "Media Orientation," of the VCSNS Emergency Plan states programs to acquaint news media with the emergency plan, information concerning radiation, and points of contacts, are offered annually through the Emergency Preparedness program in conjunction with SCANA Public Affairs Group.

Technical Evaluation: [G.5] The staff finds that the VCSNS Emergency Plan adequately describes coordinated programs that will be conducted at least annually to acquaint news media with the emergency plans, information concerning radiation, and points of contact for release of public information in an emergency. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.7.10 Conclusions

The NRC staff concludes that the information provided in the VCSNS Emergency Plan regarding public education and information is acceptable and meets the requirements of 10 CFR 50.47(b)(7) because it complies with the guidance in Planning Standard G of

NUREG-0654/FEMA-REP-1, and the applicable portions of Appendix E to 10 CFR Part 50 as described above.

13.3C.8 Emergency Facilities and Equipment

13.3C.8.1 Regulatory Basis

In determining whether the proposed emergency plan met the applicable regulatory requirements in 10 CFR 50.47(b)(8) for emergency facilities and equipment, the staff evaluated it against the detailed evaluation criteria in NUREG-0654/FEMA-REP-1. The staff also evaluated the proposed emergency plan against applicable regulatory requirements related to the area of "Emergency Facilities and Equipment," in Appendix E to 10 CFR Part 50, 10 CFR 50.34, “Contents of applications; technical information,” and 10 CFR 50.72. In addition, the staff evaluated the proposed emergency plan against the guidance in Supplement 1 to NUREG-0737, "Clarification of TMI Action Plan Requirements."

Technical Support Center

13.3C.8.2 Technical Support Center Functions

Technical Information in the Emergency Plan: [H.1] {Appendix E, Section IV.E.8} (8.2.1.a) Section 2.H.1, “Control Room, Technical Support Center (TSC), and Operations Support Center (OSC),” of the VCSNS Emergency Plan states that VCSNS has established a single TSC for the site and details the functions of the TSC in Section 2.H, “Emergency Equipment and Facilities.” When activated, the TSC functions include:

a. Support for the affected control room's emergency response efforts

b. Continued evaluation of event classification

c. Assessment of the plant status and potential offsite impact

d. Coordination of emergency response actions within the protected area (PA)

e. Communication with the NRC via ENS

f. Activation of the emergency response data system (ERDS) or ensuring that it is activated

Technical Evaluation: [H.1] {Appendix E, Section IV.E.8} (8.2.1.a) The staff finds that the VCSNS Emergency Plan adequately describes the TSC functions. This is acceptable because it meets the applicable regulatory guidance in NUREG-0654/FEMA-REP-1 and Supplement 1 to NUREG-0737, and meets the applicable requirements of Appendix E to 10 CFR Part 50.

13.3C.8.3 TSC Location

Technical Information in the Emergency Plan: (8.2.1.b) (50.34(f)(2)(xxv)) Section 2.H.1.b, “Technical Support Center,” states the TSC is located outside of and between the Protected Areas for Unit 1 and Units 2 and 3. A layout of the site with the location of the TSC is provided in each unit annex (Figures A1-1, B1-1, and C1-1). In Part 7, “Departures and Exemptions,” of the VCSNS COL application, VCS DEP 18.8-1 identifies the change for the location of the TSC

and OSC from that stated in the DCD. This SER only addresses the TSC as it relates to the proposed Units 2 and 3. The applicant proposed EP ITAACs 1.1, 3.1, and 5.1.1 to test the capabilities of the ERO facilities. In addition, NUREG-0737, Supplement 1, "Requirements for Emergency Response Capability," Section 8.2.1(b), "Technical Support Center (TSC) Requirements," states that the TSC is to be located within the site protected area so as to facilitate necessary interaction with control room, OSC, EOF, and other personnel involved with the emergency. In Section 2.H.1.b, "Technical Support Center," of the VCSNS Emergency Plan and VCS DEP 18.8-1, it states that the proposed TSC is located outside the protected areas for Unit 1 and Units 2 and 3. The TSC will be located between the two protected areas. Section 1.B, "Facility Description," of the VCSNS Emergency Plan states Units 2 and 3 are approximately 1 mile south-southwest of Unit 1. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

In RAI 13.3-44, the staff requested that the applicant provide additional information to address the siting of the TSC outside of the protected area of Units 2/3 and approximately 2500 feet (ft) from the control rooms of Units 2/3 in relation to the Supplement 1, NUREG-0737 guidance. In its response, the applicant stated that the TSC will be located in the basement of the new Nuclear Operations Building outside the protected area and within the owner controlled area (OCA). This building will also house site personnel in Operations Support, Engineering, Site Management, and other plant organizations typically assigned to the ERO to augment the shift staffing in an emergency. This is expected to facilitate the activation time of the TSC, thus improving the timeliness of taking critical tasks from the Control Room Staff and allowing for better command and control of the event(s). The separation of the TSC from any of the three control rooms will be approximately 2500 ft. The transit time between the TSC and the affected main control room (MCR) will be approximately 10 to 15 minutes and includes processing time through the Exclusion Area and Protected Area Security control points. In addition, the applicant stated that while the proposed location of the TSC does not allow for direct face-to-face communications between MCR personnel and the ED in the TSC, the TSC will have dedicated and diverse communications capabilities between the affected MCR, TSC, OSC, and the EOF. Use of current technologies such as updated computer equipment, teleconferencing, real time system monitoring of plant data, and telephone and radio systems for primary and emergency communications will bridge the physical separation. The facility will have access to plant drawings, procedures, and computer applications needed to support the evaluation and decision making processes of the ERO. Designated communicator positions will be identified to ensure continued and effective communications with the affected MCR. The data display and processing system will be used to support continuous evaluation and mitigation communications in addition to the communicators, adequate communication lines and site networked computer systems are provided.

VCS DEP 18.8-1 from the AP1000 DCD, Tier 2 material, that addresses a new location for the TSC, is discussed in Attachment 13.3A in this section of the SER. The VCSNS Emergency Plan describes dedicated and diverse communications capabilities between the control rooms, TSC, OSC, and the EOF. These communications links include:

a. Dedicated phone link for the Affected Unit to dispatch OSC teams between the OSC, TSC, and Control Room.

b. Dedicated phone link for use by the ED, EPM, and Shift Supervisor/EPOS between the Affected Unit Control Room, the TSC, and the EOF.

c. Dedicated phone link for transmission of technical data between the TSC, Affected Unit Control Room, and the EOF.

d. Dedicated phone link to discuss mitigating activities and priorities between the TSC and EOF.

e. Dedicated phone link to discuss changes in station or affected plant conditions and EPIO needs between the EOF and the JIC.

f. Station telephone line that is a communication link between activated facilities.

In addition, the communications systems in the station have diverse and back-up power supplies. (See SER Section 13.3C.9, “Emergency Communications.) The applicant proposed EP ITAAC Program Element 3.1 to test the communications between the control room and TSC. Section 13.3C.8.9 of this SER addresses plant data that is available in the TSC via the safety parameter display system (SPDS). Section 1.9, "Compliance with Regulatory Criteria," in the AP1000 DCD states that the purpose of the plant SPDS is to display important plant variables in the control room in order to assist in rapidly and reliably determining the safety status of the plant. In addition, displays are available at the operator workstations, the remote shutdown workstation, and at the TSC. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

In RAI 13.3-22(F), the staff requested additional information regarding the relocation of staff and transfer of function for the TSC and OSC in the event that they should become uninhabitable. In its response, the applicant stated that implementing procedures will provide the direction for relocating in the event that the OSC or the TSC is uninhabitable.

Technical Evaluation: (8.2.1.b) (50.34(f)(2)(xxv)) The staff finds that the clarification and additional information submitted in response to RAIs 13.3-22(F) and 13.3-44 to be acceptable because they meet the applicable requirements in 10 CFR 50.34. The VCSNS Emergency Plan describes extensive communications capabilities between the TSC and the respective unit control rooms, OSCs, EOF, and offsite EROs. These communications capabilities provide a variety of methods to ensure reliable communications and compensate for the TSC being located outside of the protected area. NUREG-0800 includes a statement that advanced communication capabilities may be used to satisfy the 2-minute travel time. In addition, having a common TSC that supports multiple reactor units and is located a moderate distance (i.e., more than 2 minutes) from the control room presents distinct advantages. These include the increased efficiency of a centralized point of support for the entire site, the elimination of confusion regarding which TSC on a multiple-unit site would be staffed in an emergency, not having to staff multiple TSCs if an incident involved more than one unit, and consideration of security-related events. From a support and functional standpoint, the staff finds that the applicant’s proposed TSC location is acceptable subject to a demonstration of adequacy during the full participation exercise (EP ITAAC Acceptance Criteria 8.1.2.1 and 8.1.2.2). This is acceptable because it meets the applicable regulatory guidance in Supplement 1 to NUREG-0737, and 10 CFR 50.34.

13.3C.8.4 TSC Staffing Requirements, Size, and Equipment

Technical Information in the Emergency Plan: (8.2.1.c and j) Section 2.H.1.b, “Technical Support Center,” of the VCSNS Emergency Plan describes the TSC, which is designed to provide a location for plant management and technical support staff to assemble and provide

support to the control room. Responsibilities of the TSC are covered in Section 2.A, "Assignment of Responsibility (Organization Control)." Figure B-1b, “Onsite Emergency Response Organization,” illustrates the staffing and organization of the TSC. Due to the configuration of the site and the presence of two separate and different technologies, there are selected positions in the ERO that have expertise in a specific technology. Those personnel will staff the specific ERO positions when that unit is the affected unit. The TSC staff has key positions staffed for each PA; Unit 1 and Units 2/3. The TSC is sized to accommodate at least 40 personnel and has supporting equipment necessary to communicate and assess emergency conditions.

Technical Evaluation: (8.2.1.c and j) The staff finds that the VCSNS Emergency Plan adequately describes the TSC staffing, size, and equipment. This is acceptable because it meets the applicable regulatory guidance in Supplement 1 to NUREG-0737.

13.3C.8.5 TSC Structure

Technical Information in the Emergency Plan: (8.2.1.d) Section 2.H.1.b of the VCSNS Emergency Plan describes the location of the TSC structure but does not state whether the TSC is designed in accordance with the Uniform Building Code (UBC). In RAI 13.3-22(D)(3), the staff requested verification that the TSC will be constructed in accordance with the UBC. In its response, the applicant stated that the TSC and the EOF will be built in accordance with State and local UBCs.

Technical Evaluation: (8.2.1.d) The staff finds the clarification and additional information submitted in response to RAI 13.3-22(D)(3) to be acceptable because they meet the guidance of Supplement 1 to NUREG -0737. The staff finds that the VCSNS Emergency Plan adequately describes the TSC structure. This is acceptable because it meets the applicable regulatory guidance in Supplement 1 to NUREG-0737.

13.3C.8.6 TSC Environmental Controls

Technical Information in the Emergency Plan: (8.2.1.e) Section 2.H.1.b of the VCSNS Emergency Plan states that personnel in the TSC shall be protected from radiological hazards. The Emergency Plan also states that the TSC directly meets most of the requirements of NUREG-0696, “Functional Criteria for Emergency Response Facilities.” ITAAC Section 5.1.1, under the Inspections, Tests, Analysis column, states, “An inspection of the TSC and OSC will be performed, including a test of capabilities. These facilities meet the criteria of NUREG-0696 with exceptions.”

In RAI 13.3-22(D)(1) the staff asked for clarification concerning the exceptions to the guidance of NUREG-0696. In it’s response to RAI 13.3-22(D)(1) the applicant explained that the only exception is the proximity of the TSC to the respective control room and facilitation of face-to-face interactions between control room and TSC personnel.

In addition, EP ITAAC Acceptance Criterion 5.1.3 will confirm that the TSC includes radiation monitors and a ventilation system with a high efficiency particulate air (HEPA) and charcoal filter, and EP ITAAC Acceptance Criterion 5.1.8 was proposed to confirm back-up electrical supply is available for the TSC. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: (8.2.1.e) The staff finds the clarification and additional information submitted in response to RAI 13.3-22(D)(1) to be acceptable . The staff finds that the VCSNS Emergency Plan adequately describes the TSC environmental controls and the availability of backup electrical supply for the TSC. This is acceptable because it meets the applicable regulatory guidance in Supplement 1 to NUREG-0737.

13.3C.8.7 TSC Radiological Protection

Technical Information in the Emergency Plan: (8.2.1.f) Section 2.H.1.b of the VCSNS Emergency Plan states that personnel in the TSC shall be protected from radiological hazards. In addition, EP ITAAC Acceptance Criterion 5.1.3 will confirm that the TSC includes radiation monitors and a ventilation system with a high efficiency particulate air (HEPA) and charcoal filter. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

In RAI 13.3-44, the staff requested that the applicant provide additional information concerning the radiological consequence analysis for the TSC against design based accidents. In its response, the applicant stated that the DCD provides the loss-of-coolant accident (LOCA) dose at the low population zone (LPZ), along with the associated atmospheric dispersion factors (X/Qs) and breathing rates. Multiplying the time-dependent LPZ doses, as provided by Westinghouse, by the TSC/LPZ ratios of X/Qs and breathing rates and conservatively assuming a 100 percent occupancy rate for the duration of the accident, the resulting TSC dose is 2.4 roentgen equivalent man (rem) total effective dose equivalent (TEDE), which is less than the 5 rem TEDE acceptance criterion of NUREG-0800. This simplified approach is conservative, as it does not take credit for structural shielding, ventilation, or filtration

Technical Evaluation: (8.2.1.f) In its response to RAI 13.3-44, as supplemented by letter dated March 3, 2010, the applicant provided a discussion of the radiological habitability analysis for the TSC to be located outside the protected area in the basement of the Nuclear Operations Building. In its response to RAI 13.3-22, the applicant stated that the design of the TSC will incorporate the guidance in NUREG-0696, “Functional Criteria for Emergency Response Facilities,” for habitability, which will be verified to be met through ITAAC related to the TSC. The TSC-related ITAAC in Section 5.1 will include verification of the configuration, cooling, habitability upon detection of radiation, and HVAC controls and displays.

Although the applicant’s RAI response indicated that the detailed design phase of the TSC HVAC system is not complete at this time, the discussion provided information on the design concept sufficient to perform design basis accident radiological consequence analyses for TSC habitability. The design concept for the TSC includes a ventilation envelope that is designed to be resistant to leakage, and an HVAC system that would isolate the TSC upon detection of high radiation in the TSC ventilation system intake and provide filtered pressurization and filtered recirculation for the duration of the event. The type of HVAC system described in the RAI response is similar in concept (i.e., system includes a HEPA and charcoal filter, and radiation monitors) to the nonsafety nuclear island nonradioactive ventilation system (VBS) described in AP1000 DCD Section 9.4, which serves the TSC in the Communications Support Area in the AP1000 design. The applicant has proposed EP ITAAC 5.1.3 in table 3.8-1 of Part 10 of its application to test this system. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

The applicant evaluated the radiological consequences in the TSC of a LOCA at VCSNS Unit 2 or 3 to show compliance with the TSC radiological habitability requirements. The LOCA

is the bounding design basis accident (DBA) for TSC habitability. The applicant stated that the HVAC system flow rates, unfiltered inleakage, outleakage, and filtration efficiencies provided in the January 7, 2010, letter are bounding values, and that the final TSC design is anticipated to result in a reduced amount of radioactivity in the TSC in an accident condition. The applicant provided atmospheric dispersion factors (χ/Q values) for a release from the containment to the TSC air intake as used in the LOCA TSC radiological habitability analysis. The staff performed an independent verification of the applicant's TSC values based on information given in the VCSNS Units 2 and 3 FSAR and Emergency Plan, and determined that the TSC χ/Q values are reasonable.

The staff reviewed the description of the TSC radiological habitability design inputs and assumptions and found them to be reasonable and consistent with the guidance in RG 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," on performing DBA radiological consequences analyses. The staff performed an independent calculation using the design values given in the January 10, 2010, RAI response and was able to confirm that the applicant's reported dose results are conservative for the proposed TSC design and meet the dose criterion.

The staff finds that the clarification and additional information in response to RAI 13.3-44 acceptable because it meets the guidance in Supplement 1 to NUREG-0737. The staff finds that the VCSNS Emergency Plan adequately describes the TSC radiological protection. This is acceptable because it meets the applicable regulatory guidance in Supplement 1 to NUREG-0737 and meets the applicable requirements of Appendix E to 10 CFR Part 50.

13.3C.8.8 TSC Communications

Technical Information in the Emergency Plan: (8.2.1.g) Section 2.H.b, "Technical Support Center," of the VCSNS Emergency Plan states the TSC has reliable voice communications to the control room, the OSC, the EOF, and the NRC as described in Section 13.3C.8.3 above. Provisions for communications with State and local operations centers are also provided in the TSC. The communications facilities include the means for reliable primary and backup communication. The TSC serves as the primary onsite communications center when activated during an emergency. Additional technical information on the TSC communications is located in Section 13.3C.6.2, "Content of the Emergency Communications Plan," of this SER.

Technical Evaluation: (8.2.1.g) The staff finds that the VCSNS Emergency Plan adequately describes the TSC communications. This is acceptable because it meets the applicable regulatory guidance in Supplement 1 to NUREG-0737.

13.3C.8.9 TSC Data Collection, Storage, and Analysis

Technical Information in the Emergency Plan: (8.2.1.h) Section 13.3C.8.9 of this SER addresses plant data that is available in the TSC via the SPDS. Section 1.9.3, "Three Mile Island Issues," in Section 1.9, "Compliance with Regulatory Criteria," of the AP1000 DCD states the purpose of the plant SPDS is to display important plant variables in the control room in order to assist in rapidly and reliably determining the safety status of the plant. In addition, displays are available at the operator workstations, the remote shutdown workstation, and at the TSC. Section 2.H.1.b of the VCSNS Emergency Plan describes the technical and operational data and information that is available in the TSC for each VCSNS unit. The TSC is equipped with a computer system, which provides source term and meteorological data and technical data displays to allow TSC personnel to perform detailed analysis and diagnosis of abnormal plant

conditions, including assessment of any significant release of radioactivity to the environment. Emergency planning ITAAC Acceptance Criterion 6.4 has been proposed to ensure the meteorological data is available in the TSC. Additional information on meteorological instrumentation is located in SER Section 2.3.3, “Onsite Meteorological Measurement Program,” and Section 7.5, “Safety Related Data Systems.” The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: (8.2.1.h) The staff finds that the VCSNS Emergency Plan adequately describes the TSC functions of Data Collection, Storage, and Analysis. This is acceptable because it meets the applicable regulatory guidance in Supplement 1 to NUREG-0737.

13.3C.8.10 TSC Human Factors Engineering

Technical Information in the Emergency Plan: (8.2.1.h and k) With respect to the TSC human factors engineering (HFE) design, Section 18.2.1, "Human Factors Engineering Program Goals, Scope, Assumptions, and Constraints," of this SER, discusses the acceptability of the implementation and verification of applicable TSC displays in accordance with the AP1000 HFE program. Tier 2, Section 18.1, “Overview,” of the AP1000 DCD states layout and environmental design of the main control room and the remote shutdown room, and the supplementary support areas such as the TSC, are designed using the traditional disciplines of human factors engineering. In a letter dated November 16, 2010, the applicant proposed an additional HFE ITAAC Acceptance Criteria 8.1.1.D.2 to demonstrate the capability of the TSC and EOF equipment and data displays to clearly identify the affected unit. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: (8.2.1.h and k) The staff finds that the VCSNS Emergency Plan adequately describes the TSC HFE design. This is acceptable because it meets the applicable regulatory guidance in Supplement 1 to NUREG-0737.

13.3C.8.11 TSC Plant Records

Technical Information in the Emergency Plan: (8.2.1.i) Section 2.H.1.b of the VCSNS Emergency Plan states that the TSC has ready access to plant records and provides a list of specific documents, procedures, reports, and drawings that will be maintained in the TSC.

Technical Evaluation: (8.2.1.i) The staff finds that the VCSNS Emergency Plan adequately describes the TSC Plant Records availability. This is acceptable because it meets the applicable regulatory guidance in Supplement 1 to NUREG-0737.

13.3C.8.12 TSC Activation

Technical Information in the Emergency Plan: [H.4] Section 2.H.5, “Activation,” of the VCSNS Emergency Plan states that the unaffected unit on-shift personnel will be used to augment the affected unit on-shift personnel upon declaration of an “alert” or higher classification. Additional responders provide support to the on-shift ERO to permit a 75-minute response goal for on-call ERO personnel. Upon reaching minimum staffing all ERFs, including the TSC, should be activated within 15 minutes. Criteria for activation are listed in Section 2.H.5, “Activation,” of the VCSNS Emergency Plan. The senior manager in charge may activate their facility without meeting minimum staffing if sufficient personnel are available to fully respond to the event.

Technical Evaluation: [H.4] The staff finds that the VCSNS Emergency Plan adequately provides for timely activation and staffing of the facilities and centers described in the plan. This is acceptable because it conforms to the guidance described in NUREG-0654/FEMA-REP-1, and Supplement 1 to NUREG-0737.

Operations Support Center

13.3C.8.13 Operations Support Center Functions

Technical Information in the Emergency Plan: [H.1] (8.3.1.a) Section 2.H.1.c, "Operations Support Center," states that each unit has an OSC where the affected unit's support personnel report and will be dispatched during an emergency. Each OSC is equipped with communication links to the control room and the TSC and carries a limited number of respirators, protective clothing, flashlights, and portable survey instruments. VCSNS disciplines reporting to the OSC include, but are not limited to:

a. Operating personnel not assigned to the control room
b. Radiation protection personnel
c. Chemistry personnel
d. Maintenance personnel (mechanical, electrical and instrumentation and control [I&C])

Technical Evaluation: [H.1] (8.3.1.a) The staff finds that the VCSNS Emergency Plan adequately describes the OSC functions. This is acceptable because it meets the applicable regulatory guidance in Supplement 1 to NUREG-0737 and conforms to the guidance described in NUREG-0654/FEMA-REP-1.

13.3C.8.14 OSC Location

Technical Information in the Emergency Plan: (8.3.1.b) (10 CFR 50.34(f)(2)(xxv)) Section 2.H.1.c, "Operations Support Center," states each unit has established an OSC. Additional information regarding each OSC is provided in the specific unit annexes which state that the OSC is located in the Control Support Area in the Annex Building on the 117'-6" elevation and is separate from the Control Room. In Part 7, "Departures and Exemptions," of the VCSNS COL application, the applicant states in VCS DEP 18.8-1 that the OSC location will be as described in the Emergency Plan. The VCSNS OSC is being moved from the location identified in AP1000 DCD Sections 18.8.3.6 and 12.5.2.2 and as described in DCD Figure 1.2-18, "Annex Building General Arrangement Plan at Elevation 100′-0″ and 107′-2″" (Note: DCD Figure 1.2-18 is security-related information, withheld under 10 CFR 2.390d). The discussion further states that the OSC is being moved to the CSA vacated by the move of the TSC.

Technical Evaluation: (8.3.1.b) (10 CFR 50.34(f)(2)(xxv)) The staff finds that the relocation of the Units 2 and 3 respective OSCs to the CSA is acceptable because the CSA provides an area that exceeds applicable regulatory requirements for an OSC; and as such, will allow the OSC to adequately support its intended emergency response functions. Therefore, the staff concludes that VCS DEP 18.8-1 is acceptable. The staff finds that the VCSNS Emergency Plan adequately describes the location of the OSC. This is acceptable because it conforms to the guidance described in Supplement 1 to NUREG-0737 and meets the applicable requirements of 10 CFR 50.34.

13.3C.8.15 OSC Coordination Activities

Technical Information in the Emergency Plan: (8.3.1.a) Section 2.H.1.c, "Operations Support Center," of the VCSNS Emergency Plan provides an overview of coordination between the control room, TSC and OSC. Section 2.8.10, "OSC Capabilities," of the VCSNS Emergency Plan states areas for coordinating, planning, and for staging personnel are available in each OSC. Additional information regarding the location, OSC Managers responsibilities, activation, tools, supplies, and equipment, radiation exposure control, and habitability of each OSC is addressed in specific unit annexes.

Technical Evaluation: (8.3.1.a) The staff finds that the VCSNS Emergency Plan adequately describes the OSC Coordination Activities functions. This is acceptable because it conforms to the regulatory guidance in Supplement 1 to NUREG-0737.

13.3C.8.16 OSC Communications

Technical Information in the Emergency Plan: (8.3.1.c) Section 2.H.1.c, "Operations Support Center," of the VCSNS Emergency Plan states that the OSC provides the resources for communicating with the control room and the TSC. Voice communication systems are capable of communication with the control room, TSC, and EOF. Communications systems are described in detail in Section 2.F, "Emergency Communications."

Technical Evaluation: (8.3.1.c) The staff finds that the VCSNS Emergency Plan adequately describes the OSC communications. This is acceptable because it meets the applicable regulatory guidance in Supplement 1 to NUREG-0737.

13.3C.8.17 OSC Activation and Staffing

Technical Information in the Emergency Plan: [H.4] Section 2.H.1.c, "Operations Support Center," of the VCSNS Emergency Plan states that the affected unit's OSC will be activated whenever the TSC is activated, but can be deactivated at the Emergency Plant Manager's (EPM's) discretion. At the "site area emergency" and "general emergency" levels, the affected unit OSC or an alternate OSC shall be activated at all times. Activation for other events is optional. See also SER Section 13.3C.8.12, "TSC Activation." Personnel who will staff the OSC are identified in Figure B-1b, "Onsite Emergency Response Organization [ERO]," of the VCSNS Emergency Plan.

Technical Evaluation: [H.4] The staff finds that the VCSNS Emergency Plan adequately provides for timely activation and staffing of the OSC. This is acceptable because it conforms to the guidance described in NUREG-0654/FEMA-REP-1.

13.3C.8.18 OSC Capacity and Supplies

Technical Information in the Emergency Plan: [H.9] Section 2.H.10, "OSC Capabilities," of the VCSNS Emergency Plan states areas for coordinating, planning, and for staging personnel are available in each OSC. Additional personnel can be accommodated in adjacent offices and locker rooms. Parts and equipment for plant maintenance are available in onsite storerooms. Radiation protection equipment is also available near the OSC. Equipment used by the damage control team is located in the maintenance shop near the OSC. The OSCs also maintains a stock of medical supplies and equipment. Additional supplies can be requested from unaffected units and corporate resources. The VCSNS Emergency Plan also describes the capacity, and

supplies, including: respiratory protection, protective clothing, portable lighting, portable radiation monitoring equipment, cameras and communications equipment for personnel present in the OSC.

Technical Evaluation: [H.9] The staff finds the VCSNS Emergency Plan adequately describes the OSC capacity and supplies. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

Emergency Operations Facility

13.3C.8.19 Emergency Operations Facility Functions

Technical Information in the Emergency Plan: [H.2] {Appendix E, Section IV.E.8} (8.4.1.a) Section 2.H.2, "Emergency Operations Facility," of the VCSNS Emergency Plan states the company will coordinate activities during an emergency under direction of the ED from the EOF. The function of the EOF is described in Section 2.H.2 as providing for; management of overall emergency response, performance of the non-delegable functions when in command and control, notification of appropriate corporate and station management, coordination of radiological and environmental assessments, determination of recommended public protective actions, management of recovery operations from an "alert" or higher classification, and coordination of emergency response activities with federal, state, and county agencies.

Technical Evaluation: [H.2] {Appendix E, Section IV.E.8} (8.4.1.a) The staff finds the VCSNS Emergency Plan adequately describes the EOF functions. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1, Supplement 1 to NUREG-0737, and the requirements of Appendix E to 10 CFR Part 50.

13.3C.8.20 EOF Location

Technical Information in the Emergency Plan: (8.4.1.b) (50.34(f)(2)(xxv)) Section 2.H.2, "Emergency Operations Facility," states that the EOF is located outside the 10-mile plume exposure pathway EPZ and greater than 10-miles from the TSC. In RAI 13.3-22(G), the staff requested additional information related to location of the new EOF and use of the existing EOF. In its response, the applicant stated that the EOF is located in a larger, multi-purpose facility. This facility is newly constructed in 2009 and was demonstrated in a FEMA offsite evaluated exercise and has been utilized to support a Unit 1 NRC evaluated exercise in 2010. The EOF is located in Richland County at the corner of Bickley Road and South Carolina Highway 176. The applicant has proposed EP ITAAC 5.2 to verify the EOF capabilities are tested with Units 2 and 3. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: (8.4.1.b) (50.34(f)(2)(xxv)) The staff finds the additional information and textual revisions submitted in response to RAI 13.3-22(G) to be acceptable because they conform to the guidance in Supplement 1 to NUREG-0737, and the staff confirmed that Revision 1 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-22(G). The staff finds the VCSNS Emergency Plan adequately describes the EOF location. This is acceptable because it conforms to the guidance in Supplement 1 to NUREG-0737 and regulations in 10 CFR 50.34(f)(2)(xxv).

13.3C.8.21 EOF Size

Technical Information in the Emergency Plan: (8.4.1.c) Section 2.H.2, of the VCSNS Emergency Plan, states that the EOF has the size capacity to accommodate 50 persons to include representatives from the local government and the NRC.

Technical Evaluation: (8.4.1.c) The staff finds the VCSNS Emergency Plan adequately describes the EOF size. This is acceptable because it conforms to the guidance in Supplement 1 to NUREG-0737.

13.3C.8.22 EOF Structural Capabilities

Technical Information in the Emergency Plan: (8.4.1.d) In the response to RAI 13.3-22 the applicant stated that the EOF facility was constructed in 2009 and inspected against the UBC standards and evaluated in an exercise as part of its support to Unit 1.

Technical Evaluation: (8.4.1.d) The staff finds the VCSNS Emergency Plan adequately describes the EOF structural capabilities. This is acceptable because it conforms to the guidance in Supplement 1 to NUREG-0737.

13.3C.8.23 EOF Environmental Requirements

Technical Information in the Emergency Plan: (8.4.1.e) Section 2.H.2 states the EOF meets the guidance in NUREG-0696, as it relates to habitability and environmental requirements. The EOF was built in 2009 and has up-to-date environmental and habitability systems.

Technical Evaluation: (8.4.1.e) The staff finds the VCSNS Emergency Plan adequately describes the EOF environmental habitability. This is acceptable because it conforms to the guidance in Supplement 1 to NUREG-0737.

13.3C.8.24 EOF Voice and Data Communications and Information Collection

Technical Information in the Emergency Plan: (8.4.1.f) Section 2.H.2 of the VCSNS Emergency Plan states that the EOF is equipped with reliable voice communications capabilities to the TSC, the control room, NRC, and State and county EOCs. In addition, the EOF has facsimile, computer transmission, and electronic transfer capabilities. The emergency communications systems at the EOF are designed to provide a reliable, timely flow of information between the parties having an emergency response role.

Technical Evaluation: (8.4.1.f) The staff finds the VCSNS Emergency Plan adequately describes the EOF voice and data communications and information collection capabilities. The EOF voice and data communications and information collection capabilities have been demonstrated in evaluated exercises supporting the existing Unit 1. This is acceptable because it conforms to the guidance in Supplement 1 to NUREG-0737.

13.3C.8.25 EOF Information Storage and Analysis

Technical Information in the Emergency Plan: (8.4.1.g) Section 2.H.2, of the VCSNS Emergency Plan states that equipment is provided to gather, store, and display data needed in the EOF to analyze and exchange information on plant conditions with the station. The EOF technical data system receives, stores, processes, and displays information sufficient to perform

assessments of the actual and potential onsite and offsite environmental consequences of an emergency condition. Data available at the EOF provides a snapshot of data from each unit's integrated set of plant data as described in Chapter 18.8, “Human System Interface Design,” of the AP1000 DCD. Plant data can be displayed at the EOF. These data are sufficient to perform accident assessment and evaluate the potential onsite and offsite environmental consequences of an emergency at the VCSNS site.

Technical Evaluation: (8.4.1.g) The staff finds the VCSNS Emergency Plan adequately describes the EOF information storage and analysis. This is acceptable because it conforms to the guidance in Supplement 1 to NUREG-0737.

13.3C.8.26 EOF Plant Records

Technical Information in the Emergency Plan: (8.4.1.h) Section 2.H.2 of the VCSNS Emergency Plan states that the EOF has ready access (either through hard copies or electronic media) to plant records, procedures, and emergency plans needed for effective overall management of VCSNS emergency response resources.

Technical Evaluation: (8.4.1.h) The staff finds the VCSNS Emergency Plan adequately describes the EOF plant records. This is acceptable because it conforms to the guidance in Supplement 1 to NUREG-0737.

13.3C.8.27 EOF Industrial Security

Technical Information in the Emergency Plan: (8.4.1.j) In RAI 13.3-22(E), the staff requested additional information to explain whether security is available at the EOF to exclude unauthorized personnel and maintain readiness when not in use. In its response, the applicant revised Section 2.H.2 to include the following text:

> The EOF is provided with access limiting devices when not in use and a posted assigned security personnel during activation to ensure that only authorized personnel are permitted to enter the facility.

Technical Evaluation: (8.4.1.j) The staff finds the additional information and textual revisions submitted in response to RAI 13.3-22(E) to be acceptable because they conform to the guidance in Supplement 1 to NUREG-0737, and the staff confirmed that Revision 1 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-22(E). Therefore, the staff finds the VCSNS Emergency Plan adequately describes EOF industrial security. This is acceptable because it conforms to the guidance in Supplement 1 to NUREG-0737.

13.3C.8.28 EOF Human Factors

Technical Information in the Emergency Plan: (8.4.1.k) SER Section 18.2.1 discusses the implementation and verification of applicable EOF displays in accordance with the AP1000 HFE program. In a letter dated November 16, 2010, the applicant proposed an additional HFE ITAAC Acceptance Criteria 8.1.1.D.2 to demonstrate the capability of the TSC and EOF equipment and data displays to clearly identify the affected unit. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: (8.4.1.k) The staff's evaluation of the EOF human factors analysis is located in Section 18.2, "Human Factors Engineering," of this SER.

13.3C.8.29 EOF Activation and Staffing

Technical Information in the Emergency Plan: [H.4] (8.4.1.i) Section 2.H.5, "Activation," states that the ERO augmentation process identifies individuals who are capable of fulfilling the specific response functions that are listed in Table B-1b. This table was developed based on the functions listed in Table B-1 of NUREG-0654/FEMA-REP-1. VCSNS will use unaffected unit on-shift personnel to augment the affected unit on-shift personnel upon declaration of an alert or higher classification. This staffing augmentation will fulfill the NUREG-0654/FEMA-REP-1, Criterion II.B.5 for 30-minute responders and provides additional support to the On-shift ERO to permit a 75-minute response for on-call ERO personnel. Although the response time will vary due to factors such as weather and traffic conditions, a goal of 75 minutes for minimum staffing, following the notification of an "alert" or higher emergency classification, has been established for the ERO personnel responding to the station emergency facilities and the EOF. In RAI 13.3-47, the staff requested additional information on where the specific staff augmentation would be provided to compensate for the lack of 30 minute responders. In response, the applicant stated:

> VCSNS Units 1, 2, and 3 are physically located on the same property site. Each plant has identical minimum staffing, including Operations, Health Physics, Chemistry, Mechanical Maintenance, Electrical Maintenance, and I&C Maintenance personnel. The personnel from these disciplines on the unaffected unit(s) will be used to augment the affected unit(s) staffing to perform actions they are trained and qualified to perform, such as radiological accident assessment, repair and corrective actions, search and rescue, chemistry/radiochemistry, etc. This staffing augmentation will fulfill the NUREG-0654 Criterion II.B.5 for 30-minute responders and provides additional support to the on-shift ERO to permit a 75-minute response for on-call ERO personnel. The time frames for rapid augmentation of nuclear power plant staff in the event of an emergency are not rigid inviolate requirements but rather goals. It is VCSNS's intent to expend its best efforts to meet the augmentation criteria goals regarding staffing Emergency Response Facilities with sufficiently skilled individuals capable of handling an emergency. While Unit 3 is under construction, Units 1 and 2 will maintain the capability to augment affected unit shift personnel.

Technical Evaluation: [H.4] (8.4.1.i) The staff finds the additional information submitted in response to RAI 13.3-47 to be acceptable because it conforms to the guidance in Supplement 1 to NUREG-0737 and NUREG-0654/FEMA-REP-1. The staff also finds that the VCSNS Emergency Plan adequately addresses the EOF activation and staffing for Units 2 and 3. The use of on-shift personnel from the other units will provide timely staffing of the ERO. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1, and Supplement 1 to NUREG-0737.

Other Emergency Facilities and Equipment

13.3C.8.30 Onsite Monitoring System

Technical Information in the Emergency Plan: [H.5] Section 2.H.6, "Monitoring Equipment Onsite," of the VCSNS Emergency Plan states that instrumentation for the detection or analysis of emergency conditions is maintained in accordance with Technical Specifications or commitments made to the NRC. Instrumentation is available for: seismic monitoring, radiation monitoring, fire protection, and meteorological monitoring. Because instrumentation varies from unit to unit, additional details of the equipment can be found in each unit's annex. Descriptions of monitoring systems related to geophysical, radiological sampling, and process monitoring are provided. Monitoring systems and instrumentation specific to each unit are discussed in detail in Section 4.2, "Assessment Resources," of each unit annex. Additional information related to monitoring systems can be found in the FSAR Section 11.5, "Radiation Monitoring." Additional information on the fire protection can be found in FSAR Section 9.5.1.8, "Fire Protection Program." Emergency equipment for environmental monitoring off-site is discussed in Section 2.H.8, "Offsite Monitoring Equipment Storage."

Technical Evaluation: [H.5] The staff finds that the VCSNS Emergency Plan adequately describes onsite monitoring systems. This is acceptable because it conforms to the guidance provided in NUREG-0654/FEMA-REP-1.

13.3C.8.31 Provisions to Acquire Data from Offsite Sources

Technical Information in the Emergency Plan: [H.6] Section 2.H.7, "Monitoring Equipment Offsite," of the VCSNS Emergency Plan states that provisions have been made to acquire data from, and have access to, the monitoring and analysis equipment from offsite sources. This capability is a back-up to onsite monitoring equipment. Meteorological data can be obtained from the NWS or the internet, if both meteorological towers are down. Seismic information can be obtained from a South Carolina State Network (SCSN) seismometer located about 3.2 miles east-southeast of Unit 1. Data for radiation and radioactive materials in the environs will be provided by South Carolina DHEC environmental monitoring program. The program is described in the applicant's Offsite Dose Calculation Manual (ODCM) and includes:

a. Fixed continuous air samplers

b. Routine sampling of river water, milk and fish

c. A fixed thermoluminescent dosimeter (TLD) monitoring network consisting of the following elements:

   (1) A near-site ring of dosimeters covering the 16 meteorological sectors.

   (2) A 16-sector ring of dosimeters placed in a zone within about 5 miles from the plant.

   (3) TLDs placed at each of the normal fixed air sampler locations (typically about 8-15 air samplers).

Alternative lab facilities for counting and analyzing samples can be provided by other nuclear stations within a few hours. Analytical assistance can be requested from State and Federal agencies, or through contracted vendors. The State maintains a radiological laboratory that

provides independent analysis. The DOE, through the Interagency Radiological Assistance Program has access to any national laboratory with a DOE contract. Lab capabilities are discussed in Section 2.C.3, "Radiological Laboratories."

Technical Evaluation: [H.6] The staff finds that the VCSNS Emergency Plan adequately describes provisions to acquire data from, or for emergency access to, offsite monitoring and analysis equipment. This is acceptable because it conforms to the guidance provided in NUREG-0654/FEMA-REP-1.

13.3C.8.32 Offsite Radiological Monitoring Equipment

Technical Information in the Emergency Plan: [H.7] Section 2.H.8, "Offsite Monitoring Equipment Storage," states VCSNS maintains a sufficient supply of emergency equipment for environmental monitoring that meet the initial requirements of two environmental Field Monitoring Teams. Additional equipment is available for other VCSNS Field Monitoring Teams through INPO mutual aid agreements, and other offsite response organizations.

Technical Evaluation: **[H.7]** The staff finds that the VCSNS Emergency Plan adequately describes the offsite radiological monitoring equipment in the vicinity of the nuclear facility. This is acceptable because it conforms to the guidance provided in NUREG-0654/FEMA-REP-1.

13.3C.8.33 Meteorological Instrumentation

Technical Information in the Emergency Plan: [H.8] Section 2.H.9, "Meteorological Monitoring," of the VCSNS Emergency Plan states that the site maintains two meteorological towers equipped with instrumentation for continuous reading of the wind speed, wind direction, air temperature, and vertical temperature difference. Representative meteorological information can also be obtained from the NWS. Section 4, "Emergency Facilities and Equipment," of each unit annex provides additional information on the meteorological capabilities of the site.

Technical Evaluation: [H.8] The staff finds that the VCSNS Emergency Plan adequately describes the meteorological instrumentation and procedures and provisions to obtain representative current meteorological information from other sources. This is acceptable because it conforms to the guidance provided in NUREG-0654/FEMA-REP-1.

13.3C.8.34 Inspection and Inventory of Emergency Equipment

Technical Information in the Emergency Plan: [H.10] Section 2.H.11, "Facility and Equipment Readiness," of the VCSNS Emergency Plan states inventory of all emergency equipment and supplies is performed on a quarterly basis and after each use. Radiation monitoring equipment is checked to verify that required calibration period and location are in accordance with the inventory lists. Surveillances include an operational check of instruments and equipment. Equipment, supplies, and parts which have a shelf-life are identified, checked, and replaced as necessary. Reserves are maintained for instruments and equipment that is removed for calibration or repair. Emergency facilities and equipment are inspected and inventoried in accordance with emergency preparedness procedures. Calibration of equipment is described to be at intervals recommended by the supplier of the equipment. Implementing Procedures are identified in Appendix 3, "Procedure Cross Reference to the Emergency Plan." These procedures provide information on location and availability of emergency equipment and supplies.

Technical Evaluation: [H.10] The staff finds that the VCSNS Emergency Plan adequately describes the provisions to inspect, inventory and operationally check emergency equipment and instruments at least once each calendar quarter and after each use. This is acceptable because it conforms to the guidance provided in NUREG-0654/FEMA-REP-1.

13.3C.8.35 Emergency Kits

Technical Information in the Emergency Plan: [H.11] Section 2.H.12, "Emergency Equipment and Supplies," of the VCSNS Emergency Plan provides a list of general equipment and supplies for emergency use by location. Facilities include the control room, TSC, EOF, and JIC. A general list of equipment and supplies is provided. A specific list of equipment and supplies by facility will be provided in the Emergency Equipment Checklist Procedure. Section 2.H.13, "General Use Emergency Equipment," states equipment that is stored in emergency kits in each facility is listed in inventory procedures.

Technical Evaluation: [H.11] The staff finds that the VCSNS Emergency Plan adequately describes the emergency kits. This is acceptable because it conforms to the guidance provided in NUREG-0654/FEMA-REP-1.

13.3C.8.36 Location to Coordinate Field Monitoring Data

Technical Information in the Emergency Plan: [H.12] Section 2.H.14, "Collection Point for Field Samples," of the VCSNS Emergency Plan states the central point for the receipt and analysis of field samples is the environmental lab in the EOF. The equipment in the lab can be used to determine the activity of the samples. Instruments are routinely calibrated to ensure availability. Field monitoring equipment is maintained at the station.

Technical Evaluation: [H.12] The staff finds that the VCSNS Emergency Plan adequately establishes a central point, the EOF Environmental Lab, for the receipt and analysis of all field monitoring data and coordination of sample media. This is acceptable because it conforms to the guidance provided in NUREG-0654/FEMA-REP-1.

13.3C.8.37 Facilities and Supplies for Emergency Medical Treatment

Technical Information in the Emergency Plan: {Appendix E, Section IV.E.4} Section 2.B.1, "On-shift Emergency Response Organization Assignments," of the VCSNS Emergency Plan states that individuals trained in first aid will be designated as a first aid team for each protected area. Section 2.H.10, "OSC Capabilities," states that the OSCs are stocked with first aid and medical treatment equipment and supplies. The first aid at the site is discussed in detail in Section 2.L.2, "Onsite First Aid Capability." This section also states that emergency treatment areas, with equipment and supplies are located in each unit and described in each unit annex. Because the annexes did not include information on emergency treatment areas, in RAI 13.3-22(C), the staff requested additional information on the location and operation of medical treatment areas located in each unit. In its response, the applicant proposed to include the following text in Annex 1, Section 4.1, "Unit-Specific Emergency Facilities:"

> Emergency treatment areas are located onsite for the treatment of those individuals requiring first aid. These areas are located at the Radiation Control Area Control Point at the 412' elevation of the Control Building and at the 436' elevation of the Service Building. Medical equipment and supplies are available at these locations.

The applicant has also proposed to add the following text to Section 4.1, "Unit-Specific Emergency Facilities" of Annexes 2 and 3:

> The health physics area near the work exits contains the personnel contamination monitoring equipment, decontamination shower facilities, and first-aid equipment.

Technical Evaluation: **{Appendix E, Section IV.E.4}** The staff finds the additional information and textual revision submitted in response to RAI 13.3-22(C) to be acceptable because they meet the requirements of Appendix E to 10 CFR Part 50. In Revision 1 of the VCSNS Emergency Plan, the staff confirmed that the revisions to the Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-22(C). The staff finds the VCSNS Emergency Plan adequately describes the facilities and medical supplies at the site for appropriate emergency first aid treatment. This is acceptable because it meets the requirements provided in Appendix E to 10 CFR Part 50.

13.3C.8.38 Maintenance of Emergency Equipment and Supplies

Technical Information in the Emergency Plan: {Appendix E, Section IV.G} Section 2.H.11, "Facility and Equipment Readiness," of the VCSNS Emergency Plan states inventory of all emergency equipment and supplies is performed on a quarterly basis and after each use. Radiation monitoring equipment is checked to verify that required calibration period and location are in accordance with the inventory lists. Equipment, supplies, and parts which have a shelf-life are identified, checked, and replaced as necessary. Reserves are maintained for instruments and equipment that is removed for calibration or repair. Emergency facilities and equipment are inspected and inventoried in accordance with emergency preparedness procedures. Section 2.P.4, "Emergency Plan and Agreement Revisions," provides information on the annual review of the emergency plan. Procedures are discussed in Section 2.P.7, "Implementing and Supporting Procedures." Procedures are identified in Appendix 3, "Procedure Cross Reference to the Emergency Plan." These procedures provide information on location and availability of emergency equipment and supplies.

Technical Evaluation: {Appendix E, Section IV.G} The staff finds that the VCSNS Emergency Plan adequately describes the provisions to ensure that the emergency plan, and its implementing procedures, and emergency equipment and supplies are maintained up-to-date. This is acceptable because it meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.8.39 ERDS Description, Testing, and Activation

Technical Information in the Emergency Plan: {Appendix E, Section VI} Section 2.F.3, "Communication Testing," of the VCSNS Emergency Plan states that testing of the communication system is performed in accordance with Section 2.N.2, "Drills." Section 2.N.2 states that primary communication methods are tested monthly. The capability to notify the NRC and Federal EROs is tested quarterly. Section 2.F.5, "ERDS," of the VCSNS Emergency Plan states, as prescribed by 10 CFR 50 Appendix E.VI, that ERDS will supply the NRC with selected plant data points on a near real time basis. The selected data points are transmitted via modem or a Virtual Private Network (VPN) to the NRC at approximately 1-minute intervals. The applicant has proposed adding AP1000 DCD Table 7.5.1, "Post-Accident Monitoring System," and FSAR Table 7.5-201, "Post-Accident Monitoring System," to each unit annex

which identifies the specific plant parameters that are available in the Control Room, TSC, and EOF. The following statement will be added to each unit annex:

> G. Emergency Response Data System (ERDS)
>
> The Emergency Response Data System (ERDS) is supported via a data link to the NRC. In accordance with 10 CFR 50, Appendix E, Section VI, the appropriate variables listed in DCD Table 7.5-1 and FSAR Table 7.5-201 including plant equipment status and parameter information for reactor core and coolant system conditions, reactor containment conditions, radioactivity release conditions, and plant meteorological conditions will be transmitted as required.

This will be tracked as **Confirmatory Item 13.3-4**.

Resolution of Confirmatory Item 13.3-4

Confirmatory Item 13.3-4 is an applicant commitment to update COL application Part 5, Emergency Plan, to include a discussion regarding the variables to be available in the ERDS. The staff verified that the COL application Part 5, Emergency Plan, was appropriately updated. As a result, Confirmatory Item 13.3-4 is now closed.

The ERO has backup methods available to provide required information to the NRC in the event that ERDS is inoperable during the declared emergency. The ERDS supplements the existing voice transmission over the ENS by providing the NRC Operations Center with timely and accurate updates of a limited set of parameters from the licensee's installed onsite computer system in the event of an emergency. The VCSNS Emergency Plan states that the licensee will test the ERDS periodically to verify system availability and operability. The frequency of ERDS testing will be quarterly.

(10 CFR 50.72(a)(4)) Section 2.F.1.b.5, "ERDS," of the VCSNS Emergency Plan states that the ERDS is activated as soon as possible, but not later than one hour after declaring an "alert," "site area emergency," or "general emergency."

Technical Evaluation: {Appendix E, Section VI} (10 CFR 50.72(a)(4)) The staff finds that the VCSNS Emergency Plan adequately describes the ERDS as a direct, near real-time, electronic data link between the licensee's onsite computer system and the NRC Operations Center that provides for the automated transmission of a limited data set of selected parameters. The staff finds that the AP1000 DCD Table 7.5.1 and FSAR Table 7.5-201 contain the plant parameters required by Section VI.2.a of Appendix E to 10 CFR Part 50, including plant equipment status and parameter information for reactor core and coolant system conditions, reactor containment conditions, radioactivity release conditions, and plant meteorological conditions. The values that will be transmitted via ERDS will be derived from this list. Therefore the staff finds that the list of plant parameters is acceptable. The staff also finds that the VCSNS Emergency Plan adequately describes the activation of ERDS and, therefore, meets the regulatory requirements in 10 CFR 50.72(a)(4).

13.3C.8.40 Conclusions

The NRC staff concludes that the information provided in the VCSNS Emergency Plan regarding emergency facilities and equipment is acceptable and meets the requirements of 10 CFR 50.47(b)(8) because it complies with the guidance in Planning Standard H of

NUREG-0654/FEMA-REP-1, the applicable portions of Appendix E to 10 CFR Part 50, and Supplement 1 to NUREG-0737 as described above.

13.3C.9 Accident Assessment

13.3C.9.1 Regulatory Basis

In determining whether the proposed emergency plan met the applicable regulatory requirements in 10 CFR 50.47(b)(9) for accident assessment, the staff evaluated it against the detailed evaluation criteria in NUREG-0654/FEMA-REP-1. The staff also evaluated the proposed emergency plan against applicable regulatory requirements related to the area of "Accident Assessment" in Appendix E to 10 CFR Part 50 and 10 CFR 50.34.

13.3C.9.2 Initiating Conditions for Emergency Classes

Technical Information in the Emergency Plan: [I.1] Section 2.I, “Accident Assessment,” of the VCSNS Emergency Plan addresses the response to emergency conditions. Section 2.I.1, “Plant Parameters and Corresponding Emergency Classification,” states plant system and effluent parameter values along with environmental and meteorological conditions are used to determine the severity of an accident leading to its emergency classification. The specific symptoms, parameter values or events for each level of emergency classification will be included in the implementing procedures. Implementing Procedures are identified in Appendix 3, “Procedure Cross-Reference to Emergency Plan,” for Emergency Classification. Administrative procedures are also identified for facilities and equipment discussed in unit-specific annexes.

Necessary equipment and instrumentation will be installed in each facility to allow for continuous availability of plant information. Instrumentation and equipment capabilities are described in Section 2.H, “Emergency Facilities and Equipment.” A list of equipment available for each unit can be found in Section 4.2.B, “Onsite Radiation Monitoring Equipment,” Table 4-1, “Radiation Monitoring System Description,” of the Unit Annex. Conditions of the plant are evaluated through monitoring of plant parameters from the control room and within the plant. The SPDS in the control room monitors reactor coolant system pressure, reactor or pressurizer water level, containment pressure, reactor power, safety system status, containment radiation level and effluent monitor readings on one display.

Technical Evaluation: [I.1] The staff finds that the VCSNS Emergency Plan adequately identifies plant system and effluent parameter values characteristic of a spectrum of off-normal conditions and accidents, and identifies the plant parameter values or other information which correspond to the initiating conditions for each emergency class. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.9.3 Capability to Continuously Assess an Accident

Technical Information in the Emergency Plan: [I.2] (10 CFR 50.34(f)(2)(xvii)) Section 2.I.2, “Onsite Accident Assessment Capabilities,” of the VCSNS Emergency Plan states that the station employs a plant parameter display systems, liquid and gaseous sampling system, area and process radiation monitors, and accident radiation monitors to acquire initial and continuous information for accident assessment. These systems are described in Section 2.H.6.b, “Monitoring Equipment Onsite,” and in Section 4.2, “Assessment Resources,” of each unit annex. The applicant has proposed EP ITAAC 6.1 to demonstrate that the means exists to

provide initial and continuing radiological assessment throughout the course of an accident through the plant computer or communications with the control room. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Section H.6.c.2, “Safety Parameter Display System (SPDS),” of the VCSNS Units 2 and 3 Emergency Plan states that the SPDS provides a display of plant parameters from which the safety status of operation may be assessed in the control room, TSC, and EOF for the station. The SPDS and/or other display systems in the TSC and EOF promote the exchange of information between these facilities and the control room and assists the emergency organization in the decision making process. Additional information related to the SPDS and measured parameters can be found in the AP1000 DCD Section 18.8.2, “Safety Parameter Display System (SPDS).” Section 1.9.5.2.9, “Post-Accident Sampling System NRC Position,” of the AP1000 DCD states that the post-accident sampling system is a subsystem of the primary sampling system described in subsection 9.3.3. The primary sampling system is designed to conform to the guidelines of the NRC’s model Safety Evaluation Report on eliminating post-accident sampling system requirements from technical specifications for operating plants. Section 9.3.3.1.2.2, “Post-Accident Sampling,” of the AP1000 DCD states there are contingency plans for obtaining and analyzing highly radioactive samples. These plans include the procedures to analyze reactor coolant for boron, containment atmosphere for hydrogen and fission products, and containment sump water for pH, during later stages of accident response. Section 1.9.3 of the AP1000 DCD, addresses the instrumentation necessary to measure, record and readout in the control room. Specifically, the AP1000 post-accident monitoring provides for indication of the following parameters: containment pressure, containment water level, containment hydrogen concentration, containment radiation intensity (high level), and noble gas effluents to ascertain reactor coolant system integrity. Section 1.9.3 of the AP1000 DCD also refers to DCD Section 11.5.5. This section provides additional information on measurement of radioactive effluents and conformance with RG 1.97, “Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident,” which addresses the capability to continuously sample radioactive iodines and particulates in gaseous effluents from all potential accident release points.

Section 2.I.3, “Source Term Determination,” states that core damage considerations are used as the bases for several of the EAL Initiating Conditions and as the threshold for the declaration of a “general emergency.” Assessment methodologies used to estimate core damage and determine core damage type are discussed. Assessment of core damage will be performed by a core damage assessment team trained in accordance with Section 2.O.4.b.2, “Core Damage Assessment Personnel.” Discussion on classification levels can be found in Section 2.D, “Emergency Classification System,” and Section 3, “Classification of Emergencies,” of each unit annex.

Section 2.I.9, “Iodine Monitoring,” states that field monitoring equipment has the capability to detect and measure airborne radioiodine concentrations as low as $1x10^{-7}$ µCi/cc in the field. Hand held survey meters are used to measure elemental iodine concentrations in air samples to check offsite release projections made based on plant data. Section 2.I.4, “Effluent Monitor Data and Dose Projection,” outlines the process for making dose projections for offsite areas.

Technical Evaluation: [I.2] (10 CFR 50.34(f)(2)(xvii)) The staff finds that the VCSNS Emergency Plan adequately describes the methods of making initial and continuing assessment of plant conditions through the course of an accident. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and meets the requirements of 10 CFR 50.34(f)(2)(xvii).

13.3C.9.4 Capability to Determine Source Term

Technical Information in the Emergency Plan: [I.3a] {Appendix E, Section IV.E.2} Section 2.I.3, "Source Term Determination," of the VCSNS Emergency Plan describes assessment methodologies used to estimate core damage and determine core damage type. Estimates of core damage can be used to determine the potential type and/or quantity of source term available for release to support offsite dose projections and determine protective action measures. The applicant has proposed EP ITAAC 6.2 to demonstrate that the means exist to determine the source term of releases of radioactive material within plant systems. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [I.3.a] {Appendix E, Section IV.E.2} The staff finds that the VCSNS Emergency Plan adequately establishes methods and techniques to be used for determining the source term of releases of radioactive material within plant systems based on plant system parameters and effluent monitors. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1, and meets the requirements of Appendix E to 10 CFR Part 50.

13.3C.9.5 Capability to Determine the Magnitude of a Radiological Release

Technical Information in the Emergency Plan: [I.3b] {Appendix E, Section IV.B} Section 2.I.4, "Effluent Monitor Data and Dose Projection," of the VCSNS Emergency Plan addresses the determination of the magnitude of a radiological release. The methods include using plant effluent monitors and system flow rates, a variety of containment failures or leak rates in conjunction with available source terms estimates, sampling of the release point, and field monitoring data. The applicant has proposed EP ITAAC 6.2 to demonstrate that the means exists to determine the magnitude of the release of radiological materials based on plant system parameters and effluent monitors. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [I.3.b] {Appendix E, Section IV.B} The staff finds that the VCSNS Emergency Plan adequately establishes methods and techniques to be used for determining the magnitude of releases of radioactive material within plant systems based on plant system parameters and effluent monitors. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1, and meets the requirements of Appendix E to 10 CFR Part 50.

13.3C.9.6 Relationship Between Effluent Monitors and Exposure

Technical Information in the Emergency Plan: [I.4] {Appendix E, Section IV.A.4} {Appendix E, Section IV.B} Section 2.I.4, "Effluent Monitor Data and Dose Projection," outlines the process for making dose assessment or projections. The Plant Parameter Display System and personal computers will provide the ERO with information required to make decisions. Instrumentation readings will be used to determine dose rates and dose at various distances from the site. Methods include measurements and samples at release points, containment leakage rates, and field data. Dose assessments will be performed by personnel using simplified computer dose models, effluent monitors, and site meteorological data. Dose assessment actions will be performed in the following sequence:

1. Onset of a release to one hour post-accident: Shift personnel will rely on a simplified computerized dose model to assist them in developing offsite dose projections using real time data from effluent monitors and site meteorology.

2. One hour post-accident to event termination: Estimates of offsite doses based on more sophisticated techniques are provided. Dedicated ERO personnel will analyze the offsite consequences of a release using more complex computerized dose modeling. These additional methods are able to analyze more offsite conditions than the simplified quick method, as well account for more specific source term considerations.

The results of the dose projections are evaluated against the EPA-400 plume exposure protective action guidelines (PAGs) for the early phase of an accident to determine the necessity for offsite PARs.

Section 4.2.A.1.c, "Onsite Meteorological Instrumentation," of each unit annex states the meteorological data necessary for making offsite dose projections is available to personnel in the control room, TSC, and EOF. The dose projection model is discussed in more depth in Section 4.2.F, "Dose Projection Model," of each unit annex. Section 4.2.F, describes the MIDAS system that is used for dose assessments. The applicant has proposed EP ITAAC 6.3 to demonstrate that the impact of a radiological release to the environment is able to be assessed by utilizing the relationship between projected effluent monitor readings, and projected onsite and offsite exposures and contamination for various meteorological conditions. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [I.4] {Appendix E, Section IV.A.4} {Appendix E, Section IV.B} The staff finds that the VCSNS Emergency Plan adequately establishes the relationship between effluent monitor readings and onsite and offsite exposures and contamination for various meteorological conditions. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and the applicable requirements in Appendix E to 10 CFR Part 50.

13.3C.9.7 Meteorological Information

Technical Information in the Emergency Plan: [I.5] Section 2.H.9, "Meteorological Monitoring," of the VCSNS Emergency Plan states the VCSNS site has two meteorological towers equipped with instrumentation for continuous reading of the wind speed, wind direction, air temperature, and vertical temperature difference. Section 2.I.5, "Meteorological Information," states this data is used by VCSNS personnel, the State, and NRC to provide near real-time predictions of the atmospheric effluent transport and diffusion. This data is available in the control room, TSC, and EOF. Section 2.F.1.b.5, "ERDS," states that the ERDS will be used to transmit data to the NRC on a real time basis according to 10 CFR Part 50 Appendix E. Backup systems are available if the ERDS fails. Section 4.2.A, "Onsite Meteorological Monitoring Instrumentation," of each unit annex, provides a description of the onsite equipment used to measure atmospheric conditions. This section also states that meteorological data from the NWS in Columbia, South Carolina, will be acquired and used when both onsite meteorological towers are not available. There are provisions for access to meteorological information by the EOF, the TSC, the control room, and an offsite NRC center. The applicant made available to the State of South Carolina suitable meteorological data processing interconnections which will permit independent analysis by the State(s) of facility generated data. The applicant has proposed EP ITAAC 6.4 to test the capability to acquire and evaluate meteorological data/information. Additional information on meteorological measurement is located at SER Section 2.3.3, "Onsite Meteorological Measurement Program." Additional information on meteorological instrumentation is located at SER Section 7.5, "Safety Related Data Systems." The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [I.5] The staff finds that the VCSNS Emergency Plan adequately describes the capability of acquiring and evaluating meteorological information. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.9.8 Projecting Dose When Instrumentation Is Inoperable

Technical Information in the Emergency Plan: [I.6] Section 2.I.6, "Unmonitored Release," of the VCSNS Emergency Plan states that dose projections can be made by using actual sample data if effluent monitors are off-scale, inoperable, or the release occurs in an unmonitored path. In these cases, a dose projection can be performed by specifying the accident category as a default. The accident category will define the mix, total curies, and the release pathway, providing an upper bound for release concentrations, dose rate, and dose. Section 2.O.4.c.3, "Dose Assessment," states that dose assessment personnel will receive initial and periodic computerized dose assessment training. The applicant has proposed EP ITAAC 6.5 to ensure a test will be performed of the capabilities to make rapid assessments of actual or projected doses and locations of radiological hazards through liquid or gaseous release pathways, including activation, notification means, field team composition, transportation, communication, monitoring equipment, and estimated deployment times. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [I.6] The staff finds that the VCSNS Emergency Plan adequately establishes the methodology for determining the release rate/projected doses if the instrumentation used for assessment are off-scale or inoperable. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.9.9 Field Monitoring Capability

Technical Information in the Emergency Plan: [I.7] Section 2.I.7, "Field Monitoring," of the VCSNS Emergency Plan states that VCSNS maintains the ability to take offsite air samples and to directly measure gamma dose rates in the event of an airborne or liquid release. Environmental measurements are used as an aid in the determination and assessment of protective and recovery actions for the general public. Offsite soil, water, and vegetation samples will be provided by either the field monitoring teams or South Carolina DHEC teams. Resources to support field teams are also discussed. Section 2.H.7.b, "Radiological Environmental Monitors and Sampling," states that an offsite environmental monitoring program will be conducted by the South Carolina DHEC that includes fixed continuous air samplers; sampling of water, milk and fish; and fixed TLDs.

Section 2.H.8, "Offsite Monitoring Equipment Storage," states that equipment sufficient for two environmental field monitoring teams is maintained at the site. Additional equipment is available for other VCSNS field monitoring teams, INPO mutual aid, and offsite response organizations. Appendix 2, "Letters of Agreement," includes a list of organizations for which the VCSNS has letters of agreement and/or memorandums of understating.

Technical Evaluation: [I.7] The staff finds that the VCSNS Emergency Plan adequately describes the capability and resources for field monitoring within the plume exposure EPZ. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.9.10 Capability to Rapidly Assess Radiological Hazards

Technical Information in the Emergency Plan: [I.8] Section 2.I.8, "Field Monitoring Teams," of the VCSNS Emergency Plan states that VCSNS has the expertise necessary to conduct limited offsite environmental survey and sampling 24 hours a day. Two teams composed of two individuals, are notified and activated at an "alert" or higher classification. Teams will assemble in the EOF and then are dispatched in company vehicles into the surrounding areas. Initial surveys involve simple measurements to quickly confirm or modify the dose projections. Subsequent measurements will be made to further define offsite consequences. Data collected by the field monitoring team will be transmitted to the emergency facilities. The data is used to define affected area boundaries, verify or modify dose projections and PARs, and assess the actual magnitude, extent, and significance of a liquid or gaseous release. The South Carolina DHEC support can be used to perform collection, shipment, and analysis of environmental sample media. The applicant has proposed EP ITAAC 6.5 to ensure a test will be performed of the capabilities to make rapid assessments of actual or projected doses and locations of radiological hazards through liquid or gaseous release pathways, including activation, notification means, field team composition, transportation, communication, monitoring equipment, and estimated deployment times. In RAI 13.3-48, the staff requested clarification on the term "limited offsite environmental survey and sampling." In its response, the applicant stated that the word "limited" is used to describe the support that can be afforded by the on-shift health physics (HPs) or by HP staff called in to support an emergency, prior to activation of the ERO. The HP staff has the responsibility to monitor radiological conditions onsite, within the PA and OCA. Upon activation of the ERF, HP staffing will be augmented by two Environmental Field Teams. These two Environmental Field Teams will be responsible for monitoring from the OCA out to the EPZ boundaries. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [I.8] The staff finds that the VCSNS Emergency Plan adequately describes methods, equipment and expertise to conduct offsite assessment of radiological hazards. This is acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.9.11 Capability to Measure Radioiodine Concentrations in Air

Technical Information in the Emergency Plan: [I.9] Section 2.I.9, "Iodine Monitoring," states field monitoring equipment has the capability to detect and measure airborne radioiodine concentrations as low as $1x10^{-7}$ µCi/cc (microcuries per cubic centimeter) in the field. Hand held survey meters are used to measure air samples to check projections of elemental iodine releases based on plant data. Noble gas and background radiation interference will be minimized by ensuring that monitoring teams move to areas of low background before analyzing the sample cartridge. The applicant has proposed EP ITAAC 6.6 to ensure a test will be performed of the capabilities to detect and measure radioiodine concentrations in air in the plume exposure EPZ, as low as 10^{-7} µCi/cc under field conditions. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [I.9] The staff finds that the VCSNS Emergency Plan adequately describes a capability to detect and measure radioiodine concentrations in air in the plume exposure EPZ as low as 10^{-7} uCi/cc under field conditions. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.9.12 Means to Relate Various Parameters to Dose Rates

Technical Information in the Emergency Plan: **[I.10]** Section 2.I.10, "Dose Estimates," states procedures exist for the correlation of air activity levels to dose rate for key isotopes. These procedures also provide a method to estimate the integrated dose from the projected and actual dose rates and for the comparison of these estimates with the PAGs. Appendix 3, "Procedure Cross-Reference to the Emergency Plan," identifies procedures for making dose assessments. The applicant has proposed EP ITAAC 6.7 to ensure a test will be performed of the capabilities to estimate integrated dose from the projected and actual dose rates, and for comparing these estimates with the EPA PAGs. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: **[I.10]** The staff finds that the VCSNS Emergency Plan adequately establishes means for relating the various measured parameters (e.g., contamination levels, water and air activity levels) to dose rates for key isotopes and gross radioactivity measurements. The VCSNS Emergency Plan also adequately describes provisions for estimating integrated dose from the projected and actual dose rates and for comparing these estimates with the protective action guides. The detailed provisions are described in separate procedures. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.9.13 Conclusions

The NRC staff concludes that the information provided in the VCSNS Emergency Plan regarding accident assessment is acceptable and meets the requirements of 10 CFR 50.47(b)(9) because it complies with the guidance in Planning Standard I of NUREG-0654/FEMA-REP-1, the applicable portions of Appendix E to 10 CFR Part 50, and 10 CFR 50.34 as described above.

13.3C.10 Protective Response

13.3C.10.1 Regulatory Basis

In determining whether the proposed emergency plan met the applicable regulatory requirements in 10 CFR 50.47(b)(10) for protective response, the staff evaluated it against the detailed evaluation criteria in NUREG-0654/FEMA-REP-1.

13.3C.10.2 Warning Onsite Personnel

Technical Information in the Emergency Plan: [J.1.a-d] Section 2.J.1, "Notification of Onsite Personnel," states all personnel within the OCA are notified of the initial classification or escalation of an emergency by alarms and verbal announcements over the plant public address system. Announcements include the emergency classification and response actions. These actions pertain to ERO, non-ERO, contractor personnel, and visitors. Provisions are made to alert personnel in high noise areas and outbuildings within the PA. The applicant has proposed EP ITAAC 7.1 to ensure a test will be performed of the capabilities to warn and advise onsite individuals of an emergency, including those in areas controlled by the operator. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [J.1.a-d] The staff finds that the VCSNS Emergency Plan adequately establishes the means and time required to warn or advise onsite individuals and individuals

who may be in areas controlled by the operator, including employees not having emergency assignments, visitors, contractor and construction personnel, and other persons who may be in the public access areas on or passing through the site or within the OCA. This is acceptable because it meets the guidance in NUREG-0654/FEMA-REP-1

13.3C.10.3 Evacuation Routes for Onsite Personnel

Technical Information in the Emergency Plan: [J.2] Section 2.J.2, "Evacuation Locations," of the VCSNS Emergency Plan states that during a site evacuation, nonessential personnel are directed to either assemble within designated assembly areas or to immediately evacuate the site. These areas are described in Section 5.2, "Unit Assembly Areas," of each unit annex. Personnel will be directed to either proceed to their homes or to reassemble at designated offsite locations. Visitors are to assemble with and follow the instructions of their escorts. Nonessential personnel within the PAs will normally exit through the normal access point. Personal transportation will be used but personnel without transportation will be identified and provided transportation. In RAI 13.3-23, the staff requested additional information related to transportation assets available to those without personal vehicles. In its response, the applicant stated that personnel who do not have transportation will typically carpool with others. If personal vehicles are not available, the lED or the ED will request assistance from the offsite authorities to transport personnel from the station.

Established evacuation routes are discussed in Section 5.3, "Unit Evacuation Routes," of each unit annex. The evacuation routes and areas to be used are determined based on wind direction and other radiological conditions. Inclement weather and high traffic density are discussed in Section 2.J.4, "Protective Actions for Onsite Personnel."

Technical Evaluation: [J.2] The staff finds the additional information submitted in response to RAI 13.3-23 to be acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1. The staff finds that the VCSNS Emergency Plan adequately describes the transportation for onsite individuals. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.10.4 Radiological Monitoring of Onsite Personnel

Technical Information in the Emergency Plan: [J.3] Section 2.J.3, "Radiological Monitoring of Evacuees," of the VCSNS Emergency Plan states that personnel will be monitored for contamination by the portal monitors as they exit the PA with portable friskers in assembly areas, or sent to offsite monitoring locations. In cases where there is no release of radioactive materials limited monitoring will be used to speed the evacuation process. Additional information on decontamination can be found in Section 2.K, "Radiological Exposure Control."

Technical Evaluation: [J.3] The staff finds that the VCSNS Emergency Plan adequately provides for radiological monitoring of people evacuated from the site. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.10.5 Evacuation of Non-essential Onsite Personnel

Technical Information in the Emergency Plan: [J.4] Section 2.J.4, "Protective Actions for Onsite Personnel," states that onsite personnel not having immediate emergency response assignments are expected to evacuate. Assembly areas and offsite locations are described in Section 5.2, "Unit Assembly Areas," in each unit annex. Monitoring equipment used in these

areas is described in Section 2.J.3, “Radiological Monitoring of Evacuees.” Decontamination is discussed in Sections 2.K.5, Contamination and Decontamination” and Section 2.K.7, “Decontamination of Relocated Personnel.”

Technical Evaluation: [J.4] The staff finds that the VCSNS Emergency Plan adequately provides for the evacuation of onsite non-essential personnel in the event of a “site area emergency” or “general emergency” and provides a decontamination capability. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.10.6 Onsite Personnel Accountability

Technical Information in the Emergency Plan: [J.5] Section 2.J.5, “Accountability,” of the VCSNS Emergency Plan states that accountability activities are initiated by the IED or the EPM. Accountability activities are required to be initiated whenever a “site area emergency” or higher classification is declared. All personnel shall be accounted for and the names of missing individuals are determined within 30 minutes of initiation. Accountability within the Protected Areas is maintained throughout the course of the event, unless terminated by the EPM. The specific procedure to be followed is identified in Appendix 3, “Procedure Cross-Reference to the Emergency Plan.”

Technical Evaluation: [J.5] The staff finds that the VCSNS Emergency Plan adequately provides for a capability to account for all individual onsite at the time of the emergency and ascertain the names of missing individuals within 30 minutes of the start of an emergency and account for all onsite individuals continuously thereafter. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.10.7 Protection for Personnel Remaining or Arriving Onsite

Technical Information in the Emergency Plan: [J.6.a-c] Section 2.J.6,” Provisions for Onsite Personnel,” of the VCSNS Emergency Plan states the site maintains an inventory of respiratory protection equipment, anti-contamination clothing, and potassium iodide (KI) that is available to emergency workers remaining onsite.

Technical Evaluation: [J.6.a-c] The staff finds that the VCSNS Emergency Plan adequately provides for individual respiratory protection, use of protective clothing, and use of radioprotective drugs (e.g., individual thyroid protection.) This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.10.8 Recommending of Protective Actions

Technical Information in the Emergency Plan: [J.7] Section 2.J.7, “Mechanism for Implementing Protective Action Recommendations,” of the VCSNS Emergency Plan, states that plant conditions, projected dose and dose rates, and/or field monitoring data are evaluated to develop PARs for the purpose of preventing or minimizing exposure to the general public. The PARs are provided by the ED to the offsite agencies responsible for implementing protective actions for the general public within the 10-mile plume exposure pathway EPZ. A flowchart of decision making for issuing PARs is provided in Figure 2.J-2, “PAR Flowchart.” In an emergency that requires immediate protective actions be taken before activation of the offsite emergency facilities, PARs are provided directly to the State and county 24 hour warning points by the IED. Section 2.J.10, “Implementation of Protective Action Recommendation,” states that EPA 400-R-92-001, “Manual of Protective Action Guides and Protective Actions for Nuclear

Incidents"; the NRC Response Technical Manual (RTM-96); and NUREG-0654/FEMA-REP-1, (Supplement 3), were used as the basis for the general public PARs. Prompt notification is made directly to the offsite authorities responsible for implementing protective measures within the plume exposure pathway EPZ.

Technical Evaluation: [J.7] The staff finds that the VCSNS Emergency Plan adequately establishes a mechanism for recommending protective actions to the appropriate State and local authorities. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.10.9 Evacuation Time Estimates

Technical Information in the Emergency Plan: [J.8] Section 2.J.8, "Evacuation Time Estimates," of the VCSNS Emergency Plan states that an independent ETE study has been performed to provide estimates of the time required to evacuate resident and transient populations surrounding the site for various times of the year under favorable and adverse conditions. The ETE report is included in the SCE&G application for a COL as Appendix 4 to the VCSNS Emergency Plan.

Technical Evaluation: [J.8] The staff finds that the VCSNS Emergency Plan adequately provides time estimates for evacuation within the plume exposure EPZ as shown in SER Section 13.3C.18 . This is acceptable because it meets the guidance in NUREG-0654/FEMA-REP-1.

13.3C.10.10 Plans to Implement Protective Measures

Technical Information in the Emergency Plan: [J.10.a] Section 2.J.10.a, "Implementation of Protective Action Recommendations," of the VCSNS Emergency Plan states that the State and county plans include official maps and information on the locations of reception centers and shelters. Each unit specific annex provides more detailed information on evacuation routes, evacuation areas, preselected radiological sampling and monitoring points, relocation centers in host areas, and shelter areas for onsite personnel. Additional protective measures information for emergency workers and offsite populations is described in the State and local emergency plans.

Technical Evaluation: [J.10.a] The staff finds that the VCSNS Emergency Plan adequately addresses evacuation routes, evacuation areas, preselected radiological sampling and monitoring points, relocation centers in host areas, and shelter areas. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

Technical Information in the Emergency Plan: [J.10.b] Section 2.J.10.b of the VCSNS Emergency Plan states that the population distribution around the station for the 10-mile radius is illustrated in Figure J-1, "Sector Population Distribution."

Technical Evaluation: [J.10.b] The staff finds that the VCSNS Emergency Plan includes figures that adequately show population distribution around the nuclear facility. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

Technical Information in the Emergency Plan: [J.10.c] Section 2.J.10.c of the VCSNS Emergency Plan, states that Section 2.E, "Notification Methods and Procedures," includes information on the capabilities to notify on-site personnel of an existing or potential emergency.

Notification of the public is described in Section 2.E.6, “Notification of the Public.” State and county agencies have the responsibility and capability to notify members of the transient and resident population within the plume exposure pathway EPZ.

Technical Evaluation: [J.10.c] The staff finds that the VCSNS Emergency Plan adequately describes the means for notifying all segments of the transient and resident population. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

Technical Information in the Emergency Plan: [J.10.m] Section 2.J.10.m of the VCSNS Emergency Plan states that at a “general emergency” classification the applicant will provide the State and counties with PARs for the public.

Technical Evaluation: [J.10.m] The staff finds that the VCSNS Emergency Plan includes the basis for recommended protective actions for the plume exposure pathway during emergency conditions. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.10.11 Conclusions

The NRC staff concludes that the information provided in the VCSNS Emergency Plan regarding protective response is acceptable and meets the requirements of 10 CFR 50.47(b)(10) because it complies with the guidance in Planning Standard J of NUREG-0654/FEMA-REP-1, as described above.

13.3C.11 Radiological Exposure Control

13.3C.11.1 Regulatory Basis

In determining whether the proposed emergency plan met the applicable regulatory requirements in 10 CFR 50.47(b)(11) for radiation exposure control, the staff evaluated it against the detailed evaluation criteria in NUREG-0654/FEMA-REP-1.

13.3C.11.2 Onsite Exposure Guidelines

Technical Information in the Emergency Plan: [K.1.a-g] Section 2.K.1, “Emergency Exposure Guidelines,” of the VCSNS Emergency Plan states that the site uses Emergency Worker and Lifesaving Activity Protective Action Guidelines set forth in EPA 400-R-92-001. In emergency situations, exposures will be justified if the maximum risks or costs to others that are avoided by their actions outweigh the risks to which the workers are subjected. The emergency worker dose limits are 5 rem TEDE for all activities; 10 rem TEDE for protecting valuable property; 25 rem TEDE for lifesaving or protection of large populations; and above 25 rem TEDE only on a voluntary basis to persons fully aware of the risks involved. Section 2.K.2, “Emergency Radiation Protection Program,” states that normal occupational doses received under emergency conditions should be maintained as low as reasonably achievable.

Technical Evaluation: [K.1.a-g] The staff finds that the VCSNS Emergency Plan adequately describes onsite exposure guidelines that are consistent with the guidance in EPA 400-R-92-001 for removal of injured persons, undertaking corrective actions, performing assessment actions, providing first aid, performing personnel decontamination, providing ambulance service, and providing medical treatment services. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.11.3 Onsite Radiation Protection Program

Technical Information in the Emergency Plan: [K.2] Guidelines for the Radiation Protection Program are summarized in Section 2.K.2, “Emergency Radiation Protection Program.” The VCSNS Emergency Plan identifies individual(s), by position who can authorize emergency workers to receive doses in excess of 10 CFR Part 20, “Standards for protection against radiation,” limits. A procedure will be established for permitting onsite volunteers to receive radiation exposures in the course of carrying out lifesaving and other emergency activities. These procedures will include expeditious decision making and a reasonable consideration of relative risks.

Technical Evaluation: [K.2] The staff finds that the VCSNS Emergency Plan adequately provides an onsite radiation protection program to be implemented during emergencies, including methods to implement exposure guidelines. This is acceptable because it conforms to the guidance of NUREG-0654/FEMA-REP-1. Additional information regarding the onsite radiological protection program is located in SER Section 12.5, "Operational Radiation Protection Program."

13.3C.11.4 Capability to Determine the Dose to Emergency Personnel

Technical Information in the Emergency Plan: [K.3.a] {Appendix E, Section IV.E.1} Section 2.K.3, “Personal Monitoring,” of the VCSNS Emergency Plan states that emergency workers will receive TLD badges and personal self-reading dosimeters capable of measuring expected exposures on a real time basis. The capability exists for the emergency processing of TLDs on a 24-hour per day basis. Provisions are also described for the distribution of dosimeters, both self-reading and permanent record devices.

Technical Evaluation: [K.3.a] {Appendix E, Section IV.E.1} The staff finds that the VCSNS Emergency Plan adequately describes provisions for 24-hour-per-day capability to determine the doses received by emergency personnel involved in any radiological emergency. This is acceptable because it conforms to the guidance of NUREG-0654/FEMA-REP-1 and meets the requirements of Appendix E to 10 CFR Part 50.

13.3C.11.5 Dose Records for Emergency Personnel

Technical Information in the Emergency Plan: [K.3.b] Section 2.K.3, “Personal Monitoring,” of the VCSNS Emergency Plan states that emergency worker dose records are maintained by the Onsite Radiological Manager in accordance with the emergency and radiological protection procedures.

Technical Evaluation: [K.3.b] The staff finds that the VCSNS Emergency Plan adequately provides for maintaining dose records for emergency workers involved in any radiological emergency. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.11.6 Decontamination Action Levels

Technical Information in the Emergency Plan: [K.5.a] Section 2.K.5, “Contamination and Decontamination,” of the VCSNS Emergency Plan states that during emergency conditions, normal plant contamination control criteria will be adhered to as much as possible. However,

these limits may be modified in accordance with existing radiation protection procedures, should conditions warrant. Section 2.K.6, “Contamination Control Measures,” states that contaminated personnel, equipment, and materials, will be decontaminated in accordance with procedures to “acceptable limits.” In RAI 13.3-33(C)(1)(2), the staff requested the definition of “acceptable limits.” In its response, the applicant stated that decontamination procedures will be included in implementing procedures that will be developed according to EP ITAAC 9.0 acceptance criteria. Action levels for decontamination personnel and equipment are specified in plant procedures. In RAI 13.3-49, the staff requested additional information on whether an EPIP for the decontamination action levels would be added to the EPIP list or whether VCSNS Procedure HPP-0158 and HPP-0160 would adequately address these action levels. In its response, the applicant provided a list of procedures that must be submitted to the NRC at least 180 days before fuel load to meet the EP ITAAC 9.0 acceptance criteria. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [K.5.a] The staff confirmed there is a procedure for decontamination listed in Appendix 3 of the VCSNS Emergency Plan. The staff finds the additional information submitted in response to RAI 13.3-33(C)(1)(2) to be acceptable. The staff finds that the VCSNS Emergency Plan adequately addresses decontamination action levels. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.11.7 Decontamination Facilities and Supplies

Technical Information in the Emergency Plan: [K.5.b] {Appendix E, Section IV.E.3} Section 2.K.5.b, “Contamination and Decontamination,” of the VCSNS Emergency Plan states that contaminated personnel will be attended to at decontamination areas located onsite. Temporary decontamination areas can also be established. Decontamination showers and supplies are provided onsite with additional personnel decontamination equipment and capabilities. Section 2.H.12, “Emergency Equipment and Supplies,” provides a general list of supplies kept in each facility. Section 1.2.5, “Annex Building,” of the AP1000 DCD identifies decontamination facilities in the Annex Building hot shop. In RAI 13.3-22(B), the staff requested additional information regarding the location of decontamination facilities and supplies that will be available for decontamination of personnel. In RAI 13.3-33(B), the staff requested additional information regarding the decontamination supplies. In its response, the applicant stated that the location of the decontamination showers will be in the HP area in each unit’s Annex Building and an inventory of specific types and numbers of decontamination supplies and equipment will be maintained in accordance with procedures to be developed according to EP ITAAC Section 9.0 acceptance criteria. Decontamination equipment will be available at various locations throughout the VCSNS site. Decontamination supplies such as various decontamination solutions, brushes, and clothes are available at these locations. Due to its location, the EOF will maintain a supply of decontamination supplies. Decontamination in accordance with plant procedures will be performed if necessary. Supplies, instruments, and equipment that are in contaminated areas will be monitored before removal. Contaminated materials will be disposed of as radwaste. Contaminated vehicles will be decontaminated before being released including any responding ambulances. In RAI 13.3-39, the staff requested additional information to specifically describe the location of onsite decontamination facilities and describe the decontamination supplies associated with these facilities as required by 10 CFR Part 50, Appendix E, Section IV.E.3. In its response, the applicant provided a revision to Section 2.K.5.b that described the specific locations for the decontamination sites and the associated supplies. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: [K.5.b] {Appendix E, Section IV.E.3} The staff finds the additional information submitted in response to RAIs 13.2-22(B), 13.3-33(B) and RAI 13.3-39 to be acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and the requirements of Appendix E to 10 CFR Part 50. RAI 13.3-39 includes a commitment to update Section 2.K.5.b to describe the specific locations for the decontamination sites and the associated supplies. This item is identified as **Confirmatory Item 13.3-5**, pending NRC review and approval of the revised VCSNS COL application.

Resolution of Confirmatory Item 13.3-5

Confirmatory Item 13.3-5 is an applicant commitment to update the COL application Part 5, Emergency Plan, to include a description of the specific locations for the decontamination sites and associated supplies. The staff verified that the VCSNS COL application Part 5, Emergency Plan, was appropriately updated. As a result, Confirmatory Item 13.3-5 is now closed.

The staff finds that the VCSNS Emergency Plan adequately addresses decontamination of emergency personnel and equipment. Section 2.K.5.b is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1, and the requirements of Appendix E to 10 CFR Part 50.

13.3C.11.8 Onsite Contamination Control

Technical Information in the Emergency Plan: [K.6.a] Section 2.K.6.a of the VCSNS Emergency Plan states contaminated areas are isolated as restricted areas with appropriate radiological protection and access control. Personnel are monitored for contamination prior to leaving the area.

[K.6.b] Section 2.K.6.b, "Contamination Control Measures," of the VCSNS Emergency Plan states that measures will be taken to control onsite access to potentially contaminated potable water and food supplies. Under emergency conditions, eating, drinking, and chewing are prohibited in all VCSNS ERFs until such time as habitability surveys indicate that such activities are permissible.

[K.6.c] Section 2.K.6.c, "Contamination Control Measures," of the VCSNS Emergency Plan states that restricted areas and contaminated items will be returned to normal use when contamination levels have been returned to acceptable levels. Contamination control criteria for returning areas and items to normal use are included in the plant procedures. In RAI 13.3-33(D) the staff requested that the applicant provide additional information on the contamination control criteria for returning areas and items to normal use. In its response, the applicant stated that contamination control criteria for returning areas and items to normal use are identified in SCE&G VCSNS Procedures HPP-0158, "Contamination Control for Equipment and Materials;" and HPP-0160, "Control and Posting of Radiation Control Zones."

Technical Evaluation: [K.6.a-c] The staff finds the additional information submitted in response to RAI 13.3-33(D) to be acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1. The staff finds that the VCSNS Emergency Plan adequately addresses the contamination control. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.11.9 Capability to Decontaminate Relocated Onsite Personnel

Technical Information in the Emergency Plan: [K.7] Section 2.K.7, “Decontamination of Relocated Personnel,” of the VCSNS Emergency Plan states that efforts will be made to prevent contaminated vehicles operated by nonessential personnel to depart the VCSNS site. Alternate forms of transportation will be made available to reduce the possibilities of transporting contamination offsite with suspected contaminated vehicles. Section 2.K.7 also states that existing and temporary facilities to limit contamination and exposure will be used and established at the site as necessary during an emergency situation. In the event that decontamination of site evacuees locally is not possible, personnel will be sent to designated locations for monitoring and decontamination. Provisions for extra clothes and decontaminates for skin contamination are available.

Technical Evaluation: [K.7] The staff finds that the VCSNS Emergency Plan adequately describes the capability for decontaminating relocated onsite personnel, including provisions for extra clothing and decontaminants suitable for the type of contamination expected. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.11.10 Conclusions

The NRC staff concludes that the information provided in the VCSNS Emergency Plan regarding radiation exposure control is acceptable and meets the requirements of 10 CFR 50.47(b)(11) because it complies with the guidance in Planning Standard K of NUREG-0654/FEMA-REP-1, and the applicable portions of Appendix E to 10 CFR Part 50 as described above.

13.3C.12 Medical and Public Health Support

13.3C.12.1 Regulatory Basis

In determining whether the proposed emergency plan met the applicable regulatory requirements in 10 CFR 50.47(b)(12) for medical and public health support, the staff evaluated it against the detailed evaluation criteria in NUREG-0654/FEMA-REP-1. The staff also evaluated the proposed emergency plan against applicable regulatory requirements related to the area of "Medical and Public Health Support," in Appendix E to 10 CFR Part 50.

13.3C.12.2 Onsite Medical Support

Technical Information in the Emergency Plan: [L.2] {Appendix E, Section IV.E.5} Section 2.L.2, “Onsite First Aid Capability,” of the VCSNS Emergency Plan states physicians and nurses are not staffed at the VCSNS site. Treatment given to injured persons by the Medical Emergency Response Team (MERT) is of a "first response" nature. The VCSNS site maintains an agreement with a local physician that serves as the company physician and is available to respond to the site to augment medical treatment. Section 2.H.12, “Emergency Equipment and Supplies,” provides a list of kits and equipment. Specific equipment is identified in the Emergency Equipment Checklist Procedure. In RAI 13.3-24(A), the staff requested the applicant provide the LOA with the physician available for onsite medical emergencies. In its response, the applicant provided an LOA with Pinner Clinic and staff to support the emergency response effort.

Technical Evaluation: [L.2] {Appendix E, Section IV.E.5} The staff finds the additional information provided in response to RAI 13.3-24(A) to be acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1. The staff finds that the VCSNS Emergency Plan adequately describes arrangements made for the services of physicians and other medical personnel qualified to handle radiation emergencies on-site. This is acceptable because it meets the requirements in Appendix E to 10 CFR Part 50 and it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.12.3 Offsite Medical Services

Technical Information in the Emergency Plan: [L.1] {Appendix E, Section IV.E.7} Section 2.L.1, "Offsite Hospital and Medical Services," of the VCSNS Emergency Plan states that there are arrangements by letter of agreement with Palmetto Richland Hospital for receiving and treating contaminated or exposed persons requiring immediate medical care. Section 2.L.3, "Medical Service Facilities," discusses backup response for contamination and exposure injuries from the REAC/TS in Oak Ridge Tennessee. In RAI 13.3-24(B), the staff requested information to explain if there are arrangements for backup hospital or physician support that can be used to treat contaminated or exposed persons requiring immediate medical care. In its response, the applicant stated that the back-up medical facility for contamination and exposure injuries is the REAC/TS. Personnel requiring treatment beyond that provided by the primary facility will be transported to REAC/TS with transportation provided by the county, State, or Federal agencies. In RAI 13.3-40, the staff requested the applicant clarify whether REAC/TS as discussed in the VCSNS Emergency Plan or Newberry County Memorial Hospital as discussed in the South Carolina State Radiological Emergency Plan, will act as a backup for the treatment of contaminated injured individuals. In its response, the applicant stated that an agreement exists between the State of South Carolina and Newberry Memorial Hospital to serve as a back-up for radiological-medical emergencies. The agreement is not with VCSNS; therefore, the VCSNS Emergency Plan identifies REAC/TS in Oak Ridge, Tennessee as the back-up to Palmetto Richland Hospital.

[L.4] {Appendix E, Section IV.E.6} Section 2.L.4, "Medical Transportation," of the VCSNS Emergency plan discusses transportation of contaminated or injured people. Arrangements are made by the station for ambulance transport to Palmetto Richland Hospital 24-hours a day by the Fairfield County Emergency Medical Services (FCEMS). The FCEMS is staffed with emergency medical technicians, paramedics, and personnel capable of handling medical emergency situations. Helicopter landing areas are also available onsite. Lexington County Emergency Medical Services (LCEMS) will provide additional services. A qualified radiation protection person will accompany the ambulance to the hospital if the injured personnel are contaminated. Monitoring services will be provided by VCSNS personnel for the transportation of contaminated persons if there is contamination present. Additional radiation protection personnel may be dispatched to Palmetto Richland Hospital if needed.

Technical Evaluation: [L.1] {Appendix E, Section IV.E.7} The staff finds the clarification provided in response to RAIs 13.3-24(B) and 13.3-40 to be acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and the regulatory requirements of Appendix E to 10 CFR Part 50. The staff finds that the VCSNS Emergency Plan adequately describes arrangements made for treatment of individuals injured in support of licensed activities on the site at treatment facilities outside the site boundary. This is acceptable because it meets the requirements in Appendix E to 10 CFR Part 50 and it conforms to the guidance in NUREG-0654/FEMA-REP-1.

[L.4] {Appendix E, Section IV.E.6} The staff finds that the VCSNS Emergency Plan adequately describes the arrangements made for transportation of contaminated injured individuals from the site to specifically identified treatment facilities outside the site boundary. This is acceptable because it meets the requirements in Appendix E to 10 CFR Part 50 and it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.12.4 Conclusions

The NRC staff concludes that the information provided in the VCSNS Emergency Plan regarding medical and public health support is acceptable and meets the requirements of 10 CFR 50.47(b)(12) because it complies with the guidance in Planning Standard L of NUREG-0654/FEMA-REP-1, the applicable portions of Appendix E to 10 CFR Part 50 as described above.

13.3C.13 Recovery and Reentry Planning and Post-Accident Operations

13.3C.13.1 Regulatory Basis

In determining whether the proposed emergency plan met the applicable regulatory requirements in 10 CFR 50.47(b)(13) for recovery and reentry planning and post-accident operations, the staff evaluated it against the detailed evaluation criteria in NUREG-0654/FEMA-REP-1. The staff also evaluated the proposed emergency plan against applicable regulatory requirements related to the area of "Recovery and Reentry Planning and Post-Accident Operations," in Appendix E to 10 CFR Part 50.

13.3C.13.2 Plans and Procedures for Reentry and Recovery

Technical Information in the Emergency Plan: [M.1] {Appendix E, Section IV.H}
Section 2.M, “Reentry and Recovery Planning,” of the VCSNS Emergency Plan describes measures taken for reentry into the Station following an accident and the concept of operation of the VCSNS Recovery Organization. Initial action is aimed at limiting consequences and protecting personnel and the general public. Reentry is divided into two categories: (1) reentry during the emergency phase; and (2) reentry during the recovery phase. All reentry activities are authorized by the EPM and coordinated by the OSC Manager and the Onsite Radiation Manager (ORM). Reentry activities during the recovery phase are authorized by the Recovery Director and coordinated by the recovery organization managers in charge of personnel making the reentry. The specific areas of consideration that are used in reentry planning are discussed in Section 2.M.1.a, “Evaluating Reentry Conditions.” Once the plant has been stabilized the recovery phase may be entered.

The ED will declare the emergency phase terminated and entry into recovery. During a “site area emergency” or “general emergency,” the ED must get concurrence from the EPM and offsite authorities. Government agencies may be notified or consulted with before declaring recovery or event termination during an “unusual event” or “alert.” During a “site area emergency” or a “general emergency,” the appropriate government agencies must be contacted prior to declaring recovery or event termination. Section 2.M.1.b, “Evaluating Entry into Recovery,” states that considerations for Termination/Recovery will be included in the implementing procedures.

The purpose of recovery is to provide the necessary personnel to affect the long-term activities and to return the plant to an acceptable condition. A short list of conditions to be used as

guidelines for the determination of establishing recovery can be found in Section 2.M.1.b. All conditions listed do not have to be met but must be considered before entering the recovery phase.

Technical Evaluation: [M.1] {Appendix E, Section IV.H} The staff finds that the VCSNS Emergency Plan adequately describes general plans and procedures for reentry and recovery and describes the means by which decisions to relax protective measures are reached. This process considers both existing and potential conditions. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1, and the applicable requirements in Appendix E to 10 CFR Part 50.

13.3C.13.3 Recovery Organization

Technical Information in the Emergency Plan: [M.2] Section 2.M, "Reentry and Recovery Planning" of the VCSNS Emergency Plan describes a recovery organization once plant conditions have been stabilized and the recovery phase has been initiated. For "unusual event" classifications, the normal on shift organization will perform necessary recovery actions. For "alert" classifications, the station's ERO will perform the recovery actions. The ED is initially designated as the Recovery Director and is responsible for directing the activities of the recovery organization. A list of responsibilities for this position is provided in Section 2.M.2.a. The General Manager, Nuclear Plant Operations, for the affected unit will become the Recovery Plant Manager. The responsibilities for this position can be found in Section 2.M.2.b. A senior member of Nuclear Support Services is the Recovery Offsite Manager. A list of responsibilities for this position in is provided in Section 2.M.2.c, "Recovery Offsite Manager." A senior SCANA Public Relations Group individual is designated as the company spokesperson. The responsibilities for this position can be found in Section 2.M.2.d, "The Company Spokesperson." All the above positions report directly to the Recovery Director. Lists of additional supervisors that may be appointed in specific areas are provided.

Technical Evaluation: [M.2] The staff finds that the VCSNS Emergency Plan adequately provides the position/title, authority and responsibilities of individuals who will fill key positions in the facility recovery organization. The organization includes technical personnel with responsibilities to develop, evaluate and direct recovery and reentry operations. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.13.4 Recovery Operations Initiation

Technical Information in the Emergency Plan: [M.3] Section 2.M.3, "Recovery Phase Notifications," of the VCSNS Emergency Plan states that all members of the ERO are informed when the decision is made to enter the recovery phase. Personnel will receive instructions concerning the organization and responsibilities during the recovery effort. The offsite authorities are notified of the shift from response to recovery and of the basic structure and management of the recovery organization.

Technical Evaluation: [M.3] The staff finds that the VCSNS Emergency Plan adequately addresses the means for informing members of the response organizations that a recovery operation is to be initiated, and of any changes in the organizational structure that may occur. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.13.5 Method to Estimate Total Population Exposure

Technical Information in the Emergency Plan: [M.4] Section 2.M.4, "Total Population Exposure," of the VCSNS Emergency Plan states that a total population exposure calculation is performed periodically and updated during recovery. A procedure has been developed for estimating total population exposure in cooperation with State and Federal agencies. Sources of data include: environment monitoring TLDs; bioassay; release rates and meteorology; monitoring of food, water, and ambient dose rates. Environmental sampling will be coordinated with State efforts and shared with the other agencies. VCSNS Emergency Plan, Appendix 3, "Procedure Cross-Reference to the Emergency Plan," shows that implementing procedures for Section M, "Recovery," will be written.

Technical Evaluation: [M.4] The staff finds that the VCSNS Emergency Plan adequately establishes a method for periodically estimating total population exposure. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.13.6 Conclusions

The NRC staff concludes that the information provided in the VCSNS Emergency Plan regarding recovery and reentry planning and post-accident operations is acceptable and meets the requirements of 10 CFR 50.47(b)(13) because it complies with the guidance in Planning Standard M of NUREG-0654/FEMA-REP-1, and the applicable portions of Appendix E to 10 CFR Part 50 as described above.

13.3C.14 Exercises and Drills

13.3C.14.1 Regulatory Basis

In determining whether the proposed emergency plan met the applicable regulatory requirements in 10 CFR 50.47(b)(14) for exercises and drills, the staff evaluated it against the detailed evaluation criteria in NUREG-0654/FEMA-REP-1. The staff also evaluated the proposed emergency plan against applicable regulatory requirements related to the area of "Exercises and Drills," in Appendix E to 10 CFR Part 50.

13.3C.14.2 Emergency Preparedness Exercise Purpose and Content

Technical Information in the Emergency Plan: [N.1.a] Section 2.N, "Drill and Exercise Program," of the VCSNS Emergency plan states that VCSNS has implemented a drill and exercise program that will: verify the adequacy of their Emergency Preparedness Program; develop, maintain, and evaluate response capabilities; and identify and correct deficiencies in the emergency plan, associated procedures, and training. The program will also ensure the continued adequacy of emergency facilities, supplies, and equipment, including communications networks. Section 2.N.1, "Exercises," states that exercises are conducted to ensure that all major elements of the emergency plan and preparedness program are demonstrated at least once in each six-year period. Personnel from VCSNS, other commercial nuclear facilities, and Federal, State, or local governments will be present to observe and critique each exercise as appropriate.

Technical Evaluation: [N.1.a] The staff finds that the VCSNS Emergency Plan adequately states that the exercises will test the integrated capability and the major elements of the emergency plans and preparedness program. In addition, the emergency preparedness

exercise will, as appropriate, simulate an emergency that results in offsite radiological releases which would require response by offsite authorities and that exercises will be conducted as set forth in the NRC and FEMA rules. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

Technical Information in the Emergency Plan: [N.1.b] Section 2.N.1, "Exercises," VCSNS Emergency Plan states that exercises are conducted to ensure that all major elements of the emergency plan and preparedness program are demonstrated at least once in each six-year period. At least one off-hours exercise, between 6:00 p.m. and 4:00 a.m. every cycle (6 years), will be conducted. Personnel from VCSNS, other commercial nuclear facilities, and federal, State, or local governments will be present to observe and critique each exercise. Section 2.N.2.f, "Augmentation Drills," states that an unannounced off-hours ERO augmentation drill is performed semiannually. At least once every 6 years an unannounced activation of the ERO Notification System with response to other facilities is also conducted.

Technical Evaluation: [N.1.b] The staff finds that the VCSNS Emergency Plan adequately states that exercises will include mobilization of State and local personnel and resources adequate to verify the capability to respond to an emergency event. In addition, the VCSNS Emergency Plan adequately describes provisions for a critique of the biennial exercise by Federal and State observers/evaluators. This is acceptable because it conform to the guidance described in NUREG-0654/FEMA-REP-1.

13.3C.14.3 Emergency Preparedness Exercises

Technical Information in the Emergency Plan: {Appendix E, Section IV.F.2} Section 2.N.1.a, "Biennial Exercises," states that VCSNS will participate in federally prescribed exercises on a rotating basis with the other fixed nuclear facilities in the state of South Carolina. Federally prescribed exercises are conducted at the station in order to test the adequacy of timing and content of implementing procedures and methods; to test emergency equipment and communication networks; and to ensure that emergency personnel are familiar with their duties.

Technical Evaluation: {Appendix E, Section IV.F.2} The staff finds that the VCSNS Emergency Plan adequately describes provisions for the conduct of emergency preparedness exercises and specifies that exercises test the adequacy of timing and content of implementing procedures and methods, test emergency equipment and communications networks, test the public notification system, and ensure that emergency organization personnel are familiar with their duties. This is acceptable because it meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.14.4 Full Participation Exercise Before Fuel Load

Technical Information in the Emergency Plan: {Appendix E, Section IV.F.2.a} VCSNS FSAR Table 13.4-201, "Operational Programs Required by NRC Regulations," states that VCSNS will conduct a full-participation exercise within 2 years of the scheduled date for initial loading of fuel in accordance with 10 CFR Part 50, Appendix E, Section IV.F.2.a(ii). The applicant also proposed ITAAC 8.1 to ensure a full participation exercise (test) will be conducted within the specified time periods of Appendix E to 10 CFR Part 50. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: {Appendix E, Section IV.F.2.a} The staff finds that the VCSNS Emergency Plan adequately describes provisions for the conduct of a full-participation exercise

before fuel load. This is acceptable because it meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.14.5 Onsite Biennial Exercise

Technical Information in the Emergency Plan: {Appendix E, Section IV.F.2.b}
Section 2.N.1.b, "Off-Year Exercises," discusses the conduct of exercises in years where an NRC exercise is not scheduled. The VCSNS site also conducts exercises prior to the biennial exercise as discussed in Section 2.N.1.c, "Pre-exercises." The principal functional areas of emergency response include activities such as management and coordination of emergency response, accident assessment, protective action decision-making, and plant system repair and corrective actions. During these drills, activation of all of the licensee's emergency response facilities (TSC, OSC, and EOF) would not be necessary. However, emergency response personnel would have the opportunity to consider accident management strategies, supervised instruction would be permitted, operating staff would have the opportunity to resolve problems (success paths), and the drills will focus on onsite training objectives.

Technical Evaluation: {Appendix E, Section IV.F.2.b} The staff finds that the VCSNS Emergency Plan adequately states that an exercise of its onsite emergency plan will be conducted every 2 years and adequately describes actions that will be taken to ensure that adequate emergency response capabilities are maintained during the interval between biennial exercises by conducting drills, including at least one drill involving a combination of some of the principal functional areas of the licensee's onsite emergency response capabilities. This is acceptable because it meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.14.6 Offsite Biennial Exercise

Technical Information in the Emergency Plan: {Appendix E, Section IV.F.2.c}
Section 2.N.1.a, "Biennial Exercises," states that VCSNS participates in federally prescribed exercises on a rotating basis with the other fixed nuclear facilities in the state of South Carolina. Exercises required by Sections IV.F.2.b, IV.F.2.c, and IV.F.2.d to Appendix E of 10 CFR Part 50, involving offsite agency participation, are conducted based on FEMA guidance and State/county emergency response plans. Exercises are conducted based on FEMA guidance and State/county emergency response plans. Exercises will test all observable portions of both on and off-site plans. Ingestion pathway exercises are conducted on a six-year cycle usually in conjunction with a full participation exercise. Section 2.N.1.b, "Off-Year Exercises," states off-year exercises, which involve little to no participation by offsite agencies, is conducted during the calendar year when an NRC evaluated exercise is not scheduled. Section 2.N.1.c, "Pre-Exercises," states pre-exercise drills may be conducted before a biennial exercise where FEMA evaluation of State and local performance is expected.

Technical Evaluation: {Appendix E, Section IV.F.2.c} The staff finds that the VCSNS Emergency Plan adequately states that offsite plans for each site will be exercised biennially with full participation by each offsite authority having a role under the VCSNS Emergency Plan. This is acceptable because it meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.14.7 Ingestion Pathway Exercise with the State

Technical Information in the Emergency Plan: {Appendix E, Section IV.F.2.d}
Section 2.N.1a, "Biennial Exercises," of the VCSNS Emergency Plan states Ingestion Pathway exercises are conducted on a six-year cycle. VCSNS participates on a rotating basis with the

other fixed nuclear facilities in the State of South Carolina. These exercises are usually conducted in conjunction with a full participation exercise as the state chooses.

Technical Evaluation: {Appendix E, Section IV.F.2.d} The staff finds that the VCSNS Emergency Plan adequately describes how the licensee will coordinate with the State of South Carolina to integrate Ingestion Pathway exercises into the biennial exercise program. This is acceptable because it meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.14.8 Enabling Local and State Participation in Drills

Technical Information in the Emergency Plan: {Appendix E, Section IV.F.2.e}
Section 2.N.1.b, "Off-Year Exercise," of the VCSNS Emergency Plan states that off-year exercises involve no or limited participation by offsite agencies, although a routine offer is made to determine the extent of participation by the offsite authorities.

Technical Evaluation: {Appendix E, Section IV.F.2.e} The staff finds that the VCSNS Emergency Plan adequately describes how the licensee will enable any State or local Government located within the plume exposure pathway EPZ to participate in the licensee's drills when requested by such State or local Government. This is acceptable because it meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.14.9 Remedial Exercises

Technical Information in the Emergency Plan: {Appendix E, Section IV.F.2.f}
Section 2.N.1.a, "Biennial Exercises," of the VCSNS Emergency Plan states that VCSNS will participate and support the conduct of activities that are designed to address any deficient or weak demonstrations. The extent of participation in remedial exercises will be sufficient to show that appropriate corrective measures have been taken regarding the elements of the plan not properly tested in the previous exercises.

Technical Evaluation: {Appendix E, Section IV.F.2.f} The staff finds that the VCSNS Emergency Plan adequately describes how remedial exercises will be conducted if the emergency plan is not satisfactorily tested during the biennial exercise, such that the NRC and FEMA, cannot find reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. This is acceptable because it meets the requirements in Appendix E to 10 CFR Part 50.

13.3C.14.10 Drills

Technical Information in the Emergency Plan: [N.2] Section 2.N.2, "Drills," of the VCSNS Emergency Plan states that drills shall be controlled and observed by individuals qualified to conduct and evaluate the drill. Drills are used to consider accident management strategies, provide supervised instruction, allow the operating staff to resolve problems and focus on internal training objectives. One or more drills may be included as portions of an exercise. Communications tests are conducted quarterly with federal organizations and annually with State and local EOCs and field assessment teams. Section 2.A.1, "Emergency Organization," of the VCSNS Emergency Plan identifies participating organizations. Communications drills and tests evaluate the operability of the communications systems and the ability to understand message content.

Technical Evaluation: [N.2] The staff finds the VCSNS Emergency Plan adequately describes how a drill is a supervised instruction period aimed at testing, developing and maintaining skills in a particular operation. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.14.11 Communications Drills

Technical Information in the Emergency Plan: [N.2.a] {Appendix E, Section IV.E.9(b)} Section 2.N.2.a, "Communication Drills," of the VCSNS Emergency Plan states that communication drills are performed monthly to test the primary and alternate methods of notifying State and local government warning points and EOCs within the plume exposure pathway EPZ. The capability to notify NRC using the ENS is also tested monthly. The capability to notify the NRC Region and Federal EROs from the EOF is tested quarterly along with the functionality of computer and communication equipment. All communication systems discussed in Section 2.F, "Emergency Communications," are tested annually. The drills include provisions to ensure that all participants are able to understand the content of the messages. Communications with Federal EROs and States listed in the Emergency Telephone Directory are demonstrated from the EOF quarterly. Communications between the nuclear facility, State and local EOCs, and field assessment teams will be tested annually.

Technical Evaluation: [N.2.a] {Appendix E, Section IV.E.9(b)} The staff finds the VCSNS Emergency Plan adequately describes how communications with Federal, State and local governments in the plume exposure pathway EPZ will be tested. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and the requirements of Appendix E to 10 CFR Part 50.

13.3C.14.12 Fire Drills

Technical Information in the Emergency Plan: [N.2.b] Section 2.N.2.b, "Fire Drills," of the VCSNS Emergency Plan states that fire drills will be conducted in accordance with the station Technical Specifications, Fire Protection Plan, and/or station procedures. The Fire Protection Program is discussed in the VCSNS FSAR Section 9.5.1.8, "Fire Protection Program." FSAR Section 9.5.1.8.2.2.4, "Drills," states that fire brigade drills are conducted at least once per calendar quarter for each shift. Each member of the fire brigade participates in at least two drills annually, one will be unannounced. At least one drill is performed annually on a "back shift" for each shift's fire brigade. The drills provide for off-site fire department participation at least annually. Triennially, a randomly selected, unannounced drill shall be conducted and critiqued by qualified individuals independent of the plant staff. Training objectives are established prior to each drill and reviewed by plant management. Criteria to be critiqued during the drills are also listed. Unsatisfactory drill performance is followed by a repeat drill within 30 days.

Technical Evaluation: [N.2b] The staff finds the VCSNS Emergency Plan adequately describes how fire drills will be conducted in accordance with the VCSNS COL FSAR. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.14.13 Medical Emergency Drills

Technical Information in the Emergency Plan: [N.2.c] Section 2.N.2.c, "Medical Emergency Drills," of the VCSNS Emergency Plan states a medical emergency drill, involving a simulated contaminated individual, is conducted annually. The drill will include provisions for participation

by local support services organizations such as ambulance and hospital support. The offsite portions of the medical drill may be performed as part of the required biennial exercise.

Technical Evaluation: [N.2.c] The staff finds the VCSNS Emergency Plan adequately describes that a medical emergency drill involving a simulated contaminated individual includes provisions for participation by the local support services agencies (i.e., ambulance and offsite medical treatment facility) will be conducted annually. In addition, the staff finds the VCSNS Emergency Plan adequately describes that the offsite portions of the medical drill may be performed as part of the required biennial exercise. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.14.14 Radiological Monitoring Drills

Technical Information in the Emergency Plan: [N.2.d] Section 2.N.2.d, "Radiological Monitoring Drills," of the VCSNS Emergency Plan states that radiological monitoring drills, both on and offsite, are conducted annually. These drills include collection and analysis of all sample media and provisions for communications and record keeping. Collection of milk is demonstrated in accordance with the ingestion pathway exercises. Section N.1.d, "Radiological Monitoring Drills," states that where appropriate, local organizations shall participate.

Technical Evaluation: [N.2.d] The staff finds the VCSNS Emergency Plan adequately describes that plant environs and radiological monitoring drills (onsite and offsite) will be conducted annually; and where appropriate, local organizations participate. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.14.15 Health Physics Drills

Technical Information in the Emergency Plan: [N.2.e] Section 2.N.2.e, "Health Physics Drills," of the VCSNS Emergency Plan states that health physics drills are conducted semiannually in each PA. The VCSNS Emergency Plan also states that HPs drills involve a response to, and analysis of, simulated elevated liquid samples and direct radiation measurements within the plant.

Technical Evaluation: [N.2.e] The staff finds the VCSNS Emergency Plan adequately describes how health physics drills will be conducted semi-annually and will involve response to, and analysis of, simulated elevated airborne and liquid samples and direct radiation measurements in the environment. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.14.16 Conduct of Drills and Exercises

Technical Information in the Emergency Plan: [N.3.a-f] Section 2.N.3, "Conduct of Drills and Exercises," of the VCSNS Emergency Plan states that advance knowledge of the scenario will be kept to a minimum to allow "free-play" decision making and ensure realistic participation. A package will be distributed to the controllers and evaluators before the drill or exercise that includes the scenario, a list of performance objectives, and a description of the expected responses. Each member of the ERO will have an opportunity to participate in a drill in their assigned facility at least once in a two-year period. Drills will be rotated among the units and their ERFs. The minimum contents for a scenario package are listed. The Station Management will provide prior approval for all drills and exercises conducted in support of the Emergency

Preparedness Program. The VCSNS Emergency Plan states that the scenarios for use in exercises and drills will include, but are not limited to, the following:

a. the basic objective(s) of each drill and exercise and appropriate evaluation criteria

b. the date(s), time period, place(s) and participating organizations

c. the simulated events

d. a time schedule of real and simulated initiating events

e. a narrative summary describing the conduct of the exercises or drills to include such things as simulated casualties, offsite fire department assistance, rescue of personnel, use of protective clothing, deployment of radiological monitoring teams, and public information activities

f. a description of the arrangements for and advance materials to be provided to official observers

Technical Evaluation: [N.3.a-f] The staff finds that the VCSNS Emergency Plan adequately describes how exercises and drills will be carried out to allow free play for decision-making and to meet the exercise objectives. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.14.17 Observing, Evaluating, and Critiquing Drills and Exercises

Technical Information in the Emergency Plan: [N.4] {Appendix E, Section IV.F.2(g)} Section 2.N.4, "Critique and Evaluation," of the VCSNS Emergency Plan states that a representative from the NRC will observe and evaluate the licensee's ability to conduct an adequate self-critical critique biennially. For full offsite participation exercises, both the NRC and FEMA will observe, evaluate, and critique. A critique is conducted as soon as possible following the conclusion of each drill or exercise. The Manager, Emergency Services will prepare a formal written critique following a drill or exercise. The report will evaluate the ability of the ERO to respond to a simulated emergency situation or sequence of events. The report will also include corrective actions and recommendations for improvement. Comments identified by participants during a training drill where objectives are not formally being evaluated will be reviewed but are not required to be included in a formal report. Section 2.N, "Drill and Exercise Program," states that the purpose of the Drill and Exercise Program is to identify deficiencies and ensure they are promptly corrected. Section 2.O.2, "Functional Training of the ERO," states that performance based training is provided that includes on-the-spot correction of erroneous performance. Any weaknesses or deficiencies will be identified and corrected.

Technical Evaluation: [N.4] {Appendix E, Section IV.F.2(g)} The staff finds that the VCSNS Emergency Plan adequately describes provisions for official observers from Federal, State or local governments to observe, evaluate, and critique the required exercises. This is acceptable because it conforms to the applicable requirements in Appendix E to 10 CFR Part 50 and the guidance described in NUREG-0654/FEMA-REP-1.

13.3C.14.18 Means to Correct Areas Needing Improvement

Technical Information in the Emergency Plan: [N.5] Section 2.N.5, "Resolution of Drill and Exercise Findings," of the VCSNS Emergency Plan states that any deficiencies identified in the emergency plan or implementing procedures through the critique process will be revised as necessary. The Manager, Emergency Services is responsible for evaluating recommendations and comments to determine which items will be incorporated into the program or require corrective actions, and for the scheduling, tracking, and evaluation of the resolution of the items.

Technical Evaluation: [N.5] The staff finds that the VCSNS Emergency Plan adequately describes a means for evaluating observer and participant comments on areas needing improvement, including emergency plan procedural changes, and for assigning responsibility for implementing corrective actions. The VCSNS Emergency Plan also establishes management control used to ensure that corrective actions are implemented. This is acceptable because it conforms to the guidance described in NUREG-0654/FEMA-REP-1.

13.3C.14.19 Conclusions

The NRC staff concludes that the information provided in the VCSNS Emergency Plan regarding exercises and drills is acceptable and meets the requirements of 10 CFR 50.47(b)(14) because it complies with the guidance in Planning Standard N of NUREG-0654/FEMA-REP-1, and the applicable portions of Appendix E to 10 CFR Part 50 as described above.

13.3C.15 Radiological Emergency Training

13.3C.15.1 Regulatory Basis

In determining whether the proposed emergency plan met the applicable regulatory requirements in 10 CFR 50.47(b)(15) for radiological emergency training, the staff evaluated it against the detailed evaluation criteria in NUREG-0654/FEMA-REP-1. The staff also evaluated the proposed emergency plan against applicable regulatory requirements related to the area of "Radiological Emergency Training," in Appendix E to 10 CFR Part 50.

13.3C.15.2 Training for Offsite Emergency Organizations

Technical Information in the Emergency Plan: [O.1.a] Section 2.O, "Emergency Response Training," of the VCSNS Emergency Plan describes the emergency response training, provided to VCSNS and offsite support personnel. Section 2.O.1.a states that training for offsite support organizations is designed to acquaint the participants with problems encountered during an emergency, notification procedures, and their expected roles. Those organizations also receive site-specific emergency response training and will be instructed, by position and title, of the identity of those persons in the onsite organization who will control their support activities.

Technical Evaluation: [O.1.a] The staff finds that the VCSNS Emergency Plan adequately describes the site-specific emergency response training to be provided for offsite emergency organizations that may be called upon to provide assistance in the event of an emergency. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.15.3 Onsite Emergency Response Organization Training

Technical Information in the Emergency Plan: [O.2] Section 2.O.1, "Assurance of Training," states that task specific training for each position in the emergency plan is described in lesson plans and guides as part of the ERO Training Program. Implementation of the training program is covered in implementing procedures and course content in the Nuclear Training Manual. Section 2.O.2, "Functional Training of the ERO," of the VCSNS Emergency Plan states that members of the ERO receive periodic performance-based emergency response training in addition to classroom training. Performance-based training includes discussion of predetermined objectives, facility walk-throughs, and supervised instruction periods or drills. On-the-spot correction of errors made during drills and a demonstration of the proper performance may be offered by the Controller. Section 2.O.4, "Emergency Response Organization Training Program," states that personnel responsible for implementing the emergency plan will receive specialized training. The program is based on the requirements of 10 CFR Part 50, Appendix E and position specific responsibilities as defined in the emergency plan. On-shift emergency response personnel are trained annually. New personnel receive an initial overview course to familiarize them with the emergency plan. The training program includes classroom training and practical drills in which each individual demonstrates ability to perform his/her assigned emergency function. During the practical drills, on-the-spot correction of erroneous performance will be made and a demonstration of the proper performance offered by the instructor.

Technical Evaluation: [O.2] The staff finds that the VCSNS Emergency Plan adequately describes the training program for members of the onsite emergency organization. This is acceptable because it conforms to the guidance described in NUREG-0654/FEMA-REP-1.

13.3C.15.4 First Aid and Rescue Team Training

Technical Information in the Emergency Plan: [O.3] [O.4.f] {Appendix E, Section IV.F.1(b)(vi)} Section 2.O.4.f, "Medical Emergency Response Team and Rescue Personnel," of the VCSNS Emergency Plan references Section 2.O.3, "First Aid Response," which states personnel are trained in accordance with the VCSNS approved First Aid Program and medical triage. This training is also available to fire brigade members and personnel providing rescue assistance.

Technical Evaluation: [O.3] [O.4.f] {Appendix E, Section IV.F.1(b)(vi)} The staff finds that the VCSNS Emergency Plan adequately describes specialized initial training for first aid and rescue teams. This is acceptable because it conforms to the guidance described in NUREG-0654/FEMA-REP-1, and meets the requirements of 10 CFR Part 50, Appendix E.

13.3C.15.5 Training Program to Implement the Emergency Plan

Technical Information in the Emergency Plan: [O.4] {Appendix E, Section IV.F.1} Section 2.O.4, "Emergency Response Organization Training Program," states ERO personnel who are responsible for implementing this plan receive specialized training. The training program for emergency response personnel is developed based on the requirements of 10 CFR 50, Appendix E and position specific responsibilities as defined in the VCSNS Emergency Plan. On-shift emergency response personnel perform emergency response activities as an extension of their normal duties and are trained annually as part of their duty specific training. Additional emergency preparedness information is provided as part of the station orientation training (SOT). New ERO personnel receive an initial overview course that

familiarizes them with the Emergency Plan by providing basic information in the following areas as well as specific information as delineated in the sections below:

a. Planning Basis
b. Emergency Classifications
c. ERO and Responsibilities
d. Call-out of ERO
e. ERFs
f. Communications Protocol/EPI
g. Offisite Organizations

Technical Evaluation: [O.4.] {Appendix E, Section IV.F.1} The staff finds that the VCSNS Emergency Plan adequately describes the training program for instructing and qualifying personnel who will implement radiological emergency response plans. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1, and meets the requirements of 10 CFR Part 50, Appendix E.

13.3C.15.6 Training for Emergency Response Organization Directors

Technical Information in the Emergency Plan: [O.4.a] {Appendix E, Section IV.F.1(b)(i)} Section 2.O.4.a, "Directors, Managers, and Coordinators within the Station ERO," of the VCSNS Emergency Plan states that personnel identified in the Emergency Planning Telephone Directory as Directors, Managers, and Coordinators for the Station ERO receive position specific training in accordance with the approved ERO training program. Contents of the training program are also discussed in this section. All personnel receive knowledge and/or performance based training initially and retraining thereafter on an annual basis.

Technical Evaluation: [O.4.a] {Appendix E, Section IV.F.1(b)(i)} The staff finds that the VCSNS Emergency Plan adequately describes the training program for instructing and qualifying directors, managers, and coordinators who will implement radiological emergency response plans. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and meets the requirements of 10 CFR Part 50, Appendix E.

13.3C.15.7 Training for Accident Assessment Personnel

Technical Information in the Emergency Plan: [O.4.b] {Appendix E, Section IV.F.1(b)(ii)} Section 2.O.4.b, "Personnel Responsible for Accident Assessment," of the VCSNS Emergency Plan states that skills and knowledge necessary to perform accident assessment duties are specific to operational positions. Personnel in these positions use normal operating procedures to perform power changes and shutdowns of the reactor. Stabilization and mitigation of the plant are normal functions performed by these personnel. Operators receive routine classroom and simulator training to ensure proficiency. Section 2.O.4.b.1, "Active Senior Licensed Control Room Personnel," describes the contents of the training program for control room personnel. Section 2.O.4.b.2, "Core Damage Assessment Personnel," discusses the training program for personnel responsible for performing core damage assessment during an emergency. These topics are covered on an annual basis. Section 2.O.4.b.2, "Core Damage Assessment Personnel," states that personnel responsible for performing core damage assessment during an accident receive classroom and hands-on training in Available Instrumentation and Equipment, Isotopic Assessment and Interpretation, and Core Damage Assessment Methodology and/or proceduralized assessment methods.

Technical Evaluation: [O.4.b] {Appendix E, Section IV.F.1(b)(ii)} The staff finds that the VCSNS Emergency Plan adequately describes specialized initial training for personnel responsible for accident assessment, including control room shift personnel. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and meets the requirements of 10 CFR Part 50, Appendix E.

13.3C.15.8 Training for Radiological Monitoring and Analysis Personnel

Technical Information in the Emergency Plan: [O.4.c] {Appendix E, Section IV.F.1(b)(iii)} Section 2.O.4.c, "Field Monitoring Teams and Radiological Analysis Personnel," discusses training of Field Monitoring Teams and Radiological Analysis Personnel. Section 2.O.4.c.1, "Field Radiological Monitoring," of the VCSNS Emergency Plan, states that the field monitoring teams will receive training in accordance with the applicant-approved training program. Content of the training program is also included. The program used to train personnel monitoring teams is discussed in Section 2.O.4.c.2, "Field Radiological Monitoring." The program used to train dose assessment personnel is discussed in Section 2.O.4.c.3, "Dose Assessment." All personnel receive knowledge and/or performance-based training initially and retraining thereafter on an annual basis.

Technical Evaluation: [O.4.c] {Appendix E, Section IV.F.1(b)(iii)} The staff finds that the VCSNS Emergency Plan adequately addresses the specialized initial training describing radiological monitoring and analysis personnel. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and meets the requirements of 10 CFR Part 50, Appendix E.

13.3C.15.9 Training for Fire Fighting Teams

Technical Information in the Emergency Plan: [O.4.d] {Appendix E, Section IV.F.1(b)(iv)} Section 2.O.4.d.1, "Local Police and Firefighting Personnel," states that local fire departments are invited to receive training as outlined in Section 2.O.1.a, "Assurance of Training," of the VCSNS Emergency Plan. Training for station fire brigade members is covered in Section 2.O.4.d.3, "Fire Brigade Teams," and is performed in accordance with training defined by the VCSNS Fire Protection Program. Section 2.N.2.b, "Fire Drills," of the VCSNS Emergency Plan states that fire drills are conducted as required by Section 9.5.1 of the VCSNS COL FSAR. VCSNS COL FSAR Section 9.5.1.8.2.2, "Fire Brigade Training," states that training is conducted by qualified individuals and consists of classroom instruction supplemented with periodic classroom retraining, practice in fire fighting, and fire drills.

Technical Evaluation: [O.4.d] {Appendix E, Section IV.F.1(b)(iv)} The staff finds that the VCSNS Emergency Plan adequately describes the specialized initial training for firefighting personnel. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and meets the requirements of 10 CFR Part 50, Appendix E.

13.3C.15.10 Training for Repair and Damage Control Teams

Technical Information in the Emergency Plan: [O.4.e] {Appendix E, Section IV.F.1(b)(v)} Training of Repair and Damage Control Teams is discussed in Section 2.O.4.e, "Repair and Damage Control Teams." These teams are made up of personnel from operations, maintenance, chemistry, and radiation protection. Personnel are trained to perform damage control and repair duties as part of their job specific training. The content of their training program is outlined in this section. All personnel receive knowledge and/or performance based

training initially and retraining thereafter on an annual basis. Fifty percent of personnel from Operations, Radiation Protection, Chemistry, and/or Maintenance, who may respond to the OSC as damage control team members, are required to be qualified in the use of respiratory protection equipment.

Technical Evaluation: [O.4.e] {Appendix E, Section IV.F.1(b)(v)} The staff finds that the VCSNS Emergency Plan adequately describes the initial training for repair and damage control teams. This is acceptable because it conforms to the guidance described in NUREG-0654/FEMA-REP-1 and meets the requirements of 10 CFR Part 50, Appendix E.

13.3C.15.11 Training for Local Emergency Management Personnel

Technical Information in the Emergency Plan: [O.4.g] {Appendix E, Section IV.F.1} Section 2.O.4.g, "Local Support Service Personnel," of the VCSNS Emergency Plan states local support service personnel are invited to receive training described in Sections 2.O.1.a and 2.O.1.b, "Assurance of Training." Training is designed to familiarize them with potential problems encountered in an emergency, notification procedures, and their expected roles. They will also receive site-specific emergency response training and be instructed as to the identity of those persons in the onsite organization who will control their support activities.

Technical Evaluation: [O.4.g] {Appendix E, Section IV.F.1} The staff finds that the VCSNS Emergency Plan adequately describes the initial training of local support services/emergency service personnel. This is acceptable because it conforms to the guidance described in NUREG-0654/FEMA-REP-1 and meets the requirements of 10 CFR Part 50, Appendix E.

13.3C.15.12 Training for Medical Support Personnel

Technical Information in the Emergency Plan: [O.4.h] {Appendix E, Section IV.F.1(b)(vii)} Section 2.O.4.h, "Medical Support Personnel," of the VCSNS Emergency Plan states onsite medical personnel are trained to handle contaminated victims and hospital interface. Offsite ambulance and hospital personnel are also offered annual training.

Technical Evaluation: [O.4.h] {Appendix E, Section IV.F.1(b)(vii)} The staff finds that the VCSNS Emergency Plan adequately describes the initial training for medical support personnel. This is acceptable because it conforms to the guidance described in NUREG-0654/FEMA-REP-1 and meets the requirements of 10 CFR Part 50, Appendix E.

13.3C.15.13 Training for Headquarters Support Personnel

Technical Information in the Emergency Plan: [O.4.i] {Appendix E, Section IV.F.1(b)(viii)} Section 2.O.4.i, "EPIO Personnel," of the VCSNS Emergency Plan states corporate and station personnel responsible for disseminating EPI, responding to media, and public information requests receive public information training.

Technical Evaluation: [O.4.i] {Appendix E, Section IV.F.1(b)(viii)} The staff finds that the VCSNS Emergency Plan adequately describes the initial training for corporate support personnel who disseminate EPI. This is acceptable because it conforms to the guidance described in NUREG-0654/FEMA-REP-1 and meets the requirements of 10 CFR Part 50, Appendix E.

13.3C.15.14 Training Related to the Transmitting Emergency Information

Technical Information in the Emergency Plan: [O.4.j] Section 2.O.4.j, "Communications Personnel," of the VCSNS Emergency Plan states ERO personnel are trained in communications protocol during an initial Emergency Response Overview Course. Personnel using specialized communications equipment and those responsible for notification of offsite agencies receive initial and annual requalification training.

Technical Evaluation: [O.4.j] The staff finds that the VCSNS Emergency Plan adequately addresses the specialized initial training described for emergency communicators. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.15.15 Training for Security Personnel

Technical Information in the Emergency Plan: {Appendix E, Section IV.F.1(b)(ix)} Section 2.O.4.d.2, "Security Personnel," of the VCSNS Emergency Plan, states that training is performed as defined by the Station Orientation Training and VCSNS Security Program. All personnel receive knowledge and/or performance based training initially and retraining thereafter on an annual basis.

Technical Evaluation: {Appendix E, Section IV.F.1(b)(ix)} The staff finds that the VCSNS Emergency Plan adequately addresses the training described for security personnel. This is acceptable because it meets the requirements of 10 CFR Part 50, Appendix E.

13.3C.15.16 Retraining of Emergency Response Personnel

Technical Information in the Emergency Plan: [O.5] {Appendix E, Section IV.F.1} Section 2.O.5, "General, Initial, and Annual Training Program Maintenance," of the VCSNS Emergency Plan states the responsibility for training and retraining personnel belongs to the station departments and Emergency Preparedness. Section 2.O.5.a, "Station Responsibilities for Station ERO personnel," states that emergency support personnel retraining will use approved lesson plans. An annual review of assembly areas, ERF assignment, potential hazards, and anticipated actions are performed as part of a continued training program.

Section 2.O.5.b, "Initial and Requalification ERO Training," provides the process used to ensure that personnel remain proficient in their duties. This includes retraining when necessary or once per year and participation in drills and exercises.

Section 2.O.5.c, "Station Orientation Training (SOT)," states all unescorted and badged personnel will receive annual requalification training on the basic elements of the Emergency Plan that includes: alarms and their meanings; assembly areas evacuation procedures; special precautions; and the purpose of the VCSNS Emergency Plan.

Technical Evaluation: [O.5] {Appendix E, Section IV.F.1} The staff finds that the VCSNS Emergency Plan adequately describes the provisions for retraining of personnel with emergency response responsibilities. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1 and meets the requirements of 10 CFR Part 50, Appendix E.

13.3C.15.17 Conclusions

The NRC staff concludes that the information provided in the VCSNS Emergency Plan regarding radiological emergency training is acceptable and meets the requirements of 10 CFR 50.47(b)(15) because it complies with the guidance in Planning Standard O of NUREG-0654/FEMA-REP-1 and the applicable portions of Appendix E to 10 CFR Part 50 as described above.

13.3C.16 Responsibility for the Planning Effort

13.3C.16.1 Regulatory Basis

In determining whether the proposed emergency plan met the applicable regulatory requirements in 10 CFR 50.47(b)(16) for responsibility for the planning effort, the staff evaluated it against the detailed evaluation criteria in NUREG-0654/FEMA-REP-1. The staff also evaluated the proposed emergency plan against applicable regulatory requirements related to the area of "Responsibility for the Planning Effort," in Appendix E to 10 CFR Part 50.

13.3C.16.2 Training for Personnel Responsible for Planning Effort

Technical Information in the Emergency Plan: [P.1] Section 2.P.1, “Emergency Preparedness Staff Training,” of the VCSNS Emergency Plan states that once a year, all emergency preparedness staff are involved in training courses, drills, exercises, seminars, workshops, or industry review and evaluation programs, in order to maintain knowledge of planning techniques and equipment.

Technical Evaluation: [P.1] The staff finds that the VCSNS Emergency Plan adequately describes the training that will be provided for individuals responsible for the planning effort. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.16.3 Person Responsible for Emergency Planning

Technical Information in the Emergency Plan: [P.2] Section 2.P.2, “Authority for the Emergency Preparedness Effort,” of the VCSNS Emergency Plan states that the Vice President, Nuclear Operations is responsible for issuance, control, and implementation of the emergency plan and all activities associated with the plan and its annexes. The Vice President, Nuclear Operations is also responsible for safe and reliable operation of the VCSNS site.

Technical Evaluation: [P.2] The staff finds that the VCSNS Emergency Plan adequately identifies the individual, by title, with the overall authority and responsibility for radiological emergency response planning. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.16.4 Designation of an Emergency Response Coordinator

Technical Information in the Emergency Plan: [P.3] Section 2.P.3, “Responsibility for Development and Maintenance of the Plan,” of the VCSNS Emergency Plan states that the Manager, Emergency Services is in charge of the emergency preparedness program and its administration. The Manager, Emergency Services works with emergency preparedness staff to ensure proper administration of the emergency plan, coordination of drills and exercises, maintenance of facilities and equipment, and ERO qualification and administration. The Vice

President, Nuclear Operations will oversee the work of the Manager, Emergency Services and his or her staff to ensure that the ERO is staffed adequately; drills and exercises are scheduled; communication system are operational; equipment and supplies are available; and implementing procedures are maintained.

Technical Evaluation: [P.3] The staff finds that the VCSNS Emergency Plan adequately designates an Emergency Planning Coordinator with responsibility for the development and updating of emergency plans and coordination of these plans with other response organizations. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.16.5 Update and Maintenance of the Emergency Plan

Technical Information in the Emergency Plan: [P.4] {Appendix E, Section IV.G} Maintenance of the emergency plan is discussed in Section 2.P.3, "Responsibility for Development and Maintenance of the Plan." Section 2.P.4, "Emergency Plan and Agreement Revisions," of the VCSNS Emergency Plan provides a process for making revisions to the emergency plan, annexes, and supporting agreements. Areas needing revision are identified by the Manager, Emergency Services during audits, assessments, training, drills, and exercises and changes are incorporated into the revisions. Changes are approved by the General Manager, Nuclear Plant Operations. The emergency plan and its annexes are revised as needed or on an annual basis. Minor changes are implemented within 30 days and significant programmatic changes within 90 days of approval. LOAs are also reviewed on an annual basis to ensure availability of resources. Implementing Procedures are revised with the emergency plan and reviewed every two years. If a need for revision is not discovered, a letter or memorandum will be written to document that no change was made. Maintenance of equipment and supplies is discussed in Section 2.H.11, "Facility and Equipment Readiness."

Technical Evaluation: [P.4] {Appendix E, Section IV.G} The staff finds that the VCSNS Emergency Plan adequately describes provisions for updating the emergency plan and agreements as needed, and reviewing and certifying it to be current on an annual basis. In addition, the updating provisions described, take into account changes identified by drills and exercises. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1, and meets the applicable requirements in Appendix E to 10 CFR Part 50.

13.3C.16.6 Distribution of Emergency Plans

Technical Information in the Emergency Plan: [P.5] Section 2.P.5, "Emergency Plan Distribution," of the VCSNS Emergency Plan states that emergency plans, unit annexes, and implementing procedures will be distributed to ERFs, selected Federal, State, and local agencies, and other appropriate locations, on a controlled basis. Electronic copies are also available on the company's computer network. Document revisions are issued to appropriate parties following approval through the procedure discussed in Section 2.P.4, "Emergency Plan and Agreement Revisions." The VCSNS Emergency Plan also states that revised pages will be dated and marked to show where changes have been made.

Technical Evaluation: [P.5] The staff finds that the VCSNS Emergency Plan adequately describes that the emergency response plans and approved changes to the plan will be forwarded to all organizations and appropriate individuals with responsibility for implementation of the plan. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.16.7 Supporting Plans

Technical Information in the Emergency Plan: [P.6] Section 2.P.6, “Supporting Emergency Response Plans,” of the VCSNS Emergency Plan provides a list of plans that support the VCSNS Emergency Plan and their sources.

Technical Evaluation: [P.6] The staff finds that the VCSNS Emergency Plan adequately describes the supporting emergency response plans. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.16.8 Emergency Plan Implementing Procedures

Technical Information in the Emergency Plan: [P.7] Section 2.P.7, “Implementing and Supporting Procedures,” of the VCSNS Emergency Plan states that a listing, by title, of procedures used to implement the emergency plan and administrative procedures can be found in Appendix 3 of the VCSNS Emergency Plan. The listing includes the section(s) of the plan to be implemented by each procedure.

Technical Evaluation: [P.7] The staff finds that the VCSNS Emergency Plan adequately includes a listing of the procedures, by title that are required to implement the plan. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.16.9 Table of Contents and Cross-Reference Table

Technical Information in the Emergency Plan: [P.8] Section 2.P.8, “Cross-Reference to Planning Criteria,” of the VCSNS Emergency Plan states that the format of the emergency plan is the same as NUREG-0654. In RAI 13.3-26(A)(2), the staff requested that a cross-reference to Appendix E to 10 CFR Part 50 be provided in the VCSNS Emergency Plan as specified in RG 1.206, "Regulatory Guide for Combined License Applications for Nuclear Power Plants." In its response, the applicant committed to add a cross-reference to Appendix E to 10 CFR Part 50 to Appendix 6. A new Table 1, “Emergency Preparedness Cross Reference Table,” was included as an attachment to this response.

Technical Evaluation: [P.8] The staff finds the additional information and textual revisions submitted in response to RAI 13.3-26(A)(2) to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1, and confirmed that Revision 1 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-26(A)(2). The staff finds that the VCSNS Emergency Plan adequately provides for a table of contents and a cross reference table to facilitate the use of the VCSNS Emergency Plan. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.16.10 Annual Independent Review of the Emergency Plan

Technical Information in the Emergency Plan: [P.9] Section 2.P.9, “Audit/Assessment of the Emergency Preparedness Program,” of the VCSNS Emergency Plan states that the Nuclear Safety Review Committee will ensure that an audit of the VCSNS Emergency Planning Program is performed at least once every 12 months. The Manager, Emergency Services is responsible for coordinating the independent review. Results are submitted for review to the Vice President, Nuclear Operations. The Manager, Emergency Services ensures necessary findings are reviewed with the offsite agencies. The State and counties receive written notification of audit

results on the adequacy of interfaces and the availability of the audit records. The audit will examine the emergency plan and implementing procedures; the Emergency Preparedness Training Program; drills and exercises; the station ERO readiness; documents and programs associated with the administrative portion of the Emergency Preparedness Program; readiness of facilities and equipment; and, interfaces between VCSNS, the State, and county governmental agencies. The review includes the emergency plan, implementing procedures and practices, training, readiness testing, equipment, and interfaces with State and local governments. Management controls are described for evaluation and correction of review findings. The result of the review, along with recommendations for improvements, will be documented, reported to appropriate licensee corporate and plant management, and involved Federal, State and local organizations, and retained for a period of five years.

Technical Evaluation: [P.9] The staff finds that the VCSNS Emergency Plan adequately describes arrangements for and the conduct of independent reviews of the emergency preparedness program at least every 12 months. This is acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

13.3C.16.11 Quarterly Update of Emergency Telephone Numbers

Technical Information in the Emergency Plan: [P.10] Section 2.P.10, "Maintenance of Emergency Telephone Numbers," of the VCSNS Emergency Plan states that names and phone numbers will be reviewed and updated at least quarterly. This includes the ERO, support agencies, and ERFs in the implementing procedures and the Emergency Planning Telephone Directory.

Technical Evaluation: [P.10] The staff finds that the VCSNS Emergency Plan adequately provides for updating telephone numbers in emergency procedures at least quarterly. This is acceptable because it conforms to the guidance provided in NUREG-0654/FEMA-REP-1.

13.3C.16.12 Conclusions

The NRC staff concludes that the information provided in the VCSNS Emergency Plan regarding the responsibility for EP is acceptable and meets the requirements of 10 CFR 50.47(b)(16) because it complies with the guidance in Planning Standard P of NUREG-0654/FEMA-REP-1, and the applicable portions of Appendix E to 10 CFR Part 50 as described above.

13.3C.17 Security-Based Event Considerations

13.3C.17.1 Regulatory Basis

NUREG-0800, Chapter 13.3, "Emergency Planning," specifies that applicants for a combined license address the information in the Commission orders issued February 25, 2002, as well as any subsequent NRC guidance, to determine what security-related aspects of EP and preparedness should be addressed in the emergency plan.

NUREG-0800, the Commission Orders issued February 25, 2002, and security-related enhancements identified in NRC Bulletin 2005-02, "Emergency Preparedness and Response Actions for Security-Based Events," identify the following areas that applicants should consider in the COL application, Emergency plan, or emergency plan implementing procedures:

1. Security-based Emergency Classification Levels and EALs - The emergency plan includes EALs to ensure that a site-specific, security event results in an emergency classification declaration of at least a notification of unusual event. The classification scheme should also reflect the strategy for escalation to a higher-level event classification.

2. NRC Notifications - Notification procedures allow for NRC notification of safeguards events immediately after notification of local law enforcement agencies, or within about 15 minutes of the recognition of a security-based threat.

3. Onsite Protective Measures - Consideration has been given to a range of protective measures for site workers, as appropriate, during a security-based event (e.g., evacuation of personnel from target buildings, site evacuation by opening security gates, dispersal of licensed operators, sheltering of personnel in structures away from potential site targets, and arrangements for accounting for personnel after attack).

4. ERO Augmentation - ERFs and alternative facilities have been identified to support the rapid response from ERO members to mitigate site damage from a security-based event once the site is secured. The alternative facilities could likely be located outside of the PA and should include the following characteristics: accessible even if the site is under threat or actual attack; communication links with the EOF, control room and plant security; the capability to perform offsite notifications; and the capability for engineering assessment activities, including damage control team planning and preparation. The alternative facility should also be equipped with general plant drawings and procedures, telephones, and computer links to the site.

5. Potential Vulnerabilities from Nearby Hazardous Facilities, Dams, and other Sites - The potential effect has been determined on the plant, onsite staffing and augmentation, and onsite evacuation strategies from damage to nearby hazardous facilities, dams, and other nearby sites, in consideration of a security-based event.

6. Drills and Exercises - Emergency Preparedness drill and exercise programs maintain the key skills necessary for mitigating security-based events. The ERO demonstrates security-based emergency preparedness program activities under the schedule as committed to in its emergency plans.

7. Emergency Preparedness and Response to a Security-based Event - Onsite staffing, facilities, and procedures are adequate to accomplish actions necessary to respond to a security-based event, and the emergency plan and/or procedures reflect the site-specific needs.

13.3C.17.2 Security-Based Emergency Classification and Emergency Action Levels

Technical Information in the Emergency Plan: (NUREG-0800) Emergency classifications for security or hostile action-based events are included in the EALs addressed in Section 13.3C.4 of this SER.

Technical Evaluation: (NUREG-0800) The staff's evaluation is also included in Section 13.3C.4 of this SER.

13.3C.17.3 NRC Notification

Technical Information in the Emergency Plan: (NUREG-0800) Notification requirements are addressed in Section 13.3C.5.8, 'Notification to the NRC."

Technical Evaluation: (NUREG-0800) The staff's evaluation is also included in Section 13.3C.5.8 of this SER.

13.3C.17.4 Onsite Protective Measures

Technical Information in the Emergency Plan: (NUREG-0800)

Section 2.J.6, "Protective Measures," of the VCSNS Emergency Plan addresses protective measures in the event of a hostile attack against the site. Section 2.J.6, "Protective Measures," states that in the event of a hostile attack against the site, conditions may dictate initiation of protective measures other than personnel assembly, accountability and evacuation. The Emergency Coordinator will make decisions regarding appropriate protective measures based on evaluation of site conditions, including input from the security force. If, based on the judgment of the Emergency Coordinator, personnel assembly, accountability, and evacuation may result in undue hazards to site personnel; the Emergency Coordinator may direct other protective measures, including:

- evacuation of personnel from areas and buildings perceived as high-value targets
- site evacuation by opening, while continuing to defend security gates
- dispersal of key personnel
- onsite sheltering
- staging of ERO personnel in alternate locations pending
- restoration of safe conditions
- implementation of accountability measures following restoration of safe conditions

Technical Evaluation: (NUREG-0800)

The staff finds the VCSNS Emergency Plan adequately describes onsite protective measures necessary to respond to a security event. This is acceptable because it meets the guidance in NUREG-0800.

13.3C.17.5 Emergency Response Organization Augmentation

Technical Information in the Emergency Plan: (NUREG-0800) ERO augmentation is addressed in Sections 2.E.2, "Notification and Mobilization of Emergency Response Personnel Measures," 2.H.5, "Activation," and 2.N.2, "Drills," in the VCSNS Emergency Plan. In RAI 13.3-50(1), the staff requested additional information to address alternate ERO facilities to be used during security-based events. In its response, the applicant stated that a statement will be added to the VCSNS Emergency Plan to indicate that the EOF is designed to be an alternate facility to support response to a hostile-action event. The VCSNS EOF is designed to support a remote TSC and OSC in the event of an emergency which limits access to the site. This item is

identified as **Confirmatory Item 13.3-6**, pending NRC review and approval of the revised VCSNS COL application.

Resolution of Confirmatory Item 13.3-6

Confirmatory Item 13.3-6 is an applicant commitment to update COL application Part 5, Emergency Plan, to indicate that the EOF is designed to be an alternate facility to support response to a hostile-action event. The staff verified that the COL application Part 5, Emergency Plan, was appropriately updated. As a result, Confirmatory Item 13.3-6 is now closed.

Implementing procedures will provide guidance for notifying the ERO to respond to the EOF instead of the site in the event of a hostile action, which limits access to the site. These procedures will be developed according to Emergency Planning ITAAC Section 9.0. In addition, the applicant's response to RAI 13.3-50(2) stated that the VCSNS Emergency Plan, Part 2, Section 2.J, "Protective Response," describes protective actions and protective measures to safeguard the health and safety of onsite personnel and the general public during an emergency. Section 2.J.5, "Accountability," describes the personnel accountability process and incorporates decision making during a security event. During a security event, conditions may dictate initiation of protective measure other than personnel evacuation, assembly and accountability. The ED makes decisions regarding appropriate protective measures based on evaluation of site conditions, including input from Security. The ED may direct other protective measures if personnel evacuation, assembly and accountability may result in undue hazards to site personnel. In addition, Section 2.B, "Emergency Response Organization," addresses command and control for any site-wide emergency, such as a security-based event and Section 2.H, "Emergency Facilities and Equipment," states that Unit 1 will take the lead for any site-wide event. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: (NUREG-0800) The staff finds that the VCSNS Emergency Plan adequately describes onsite protective measures, including ERO augmentation, necessary to respond to a security event. This is acceptable because it meets the guidance in NUREG-0800.

13.3C.17.6 Potential Vulnerabilities from Nearby Hazardous Facilities, Dams, and Other Sites

Technical Information in the Emergency Plan: (NUREG-0800) The assessment of other nearby hazards that could potentially affect the safety of the VCSNS facility was not addressed in the VCSNS Emergency Plan. In RAI 13.3-50(2) the staff requested additional information concerning other nearby hazards that could cause a security-based event. In its response, the applicant stated that in VCSNS COL FSAR Chapter 2 discusses external events from nearby hazardous facilities. As stated in FSAR Section 2.2.2, the only industrial facilities located within 5 miles of the proposed VCSNS Units 2 and 3 site are: VCSNS Unit 1, Fairfield Pumped Storage Facility, Parr Hydro and Parr Combustion Turbines. These facilities are owned and operated by SCE&G. FSAR Figure 2.2-203 shows the locations of these SCE&G facilities relative to VCSNS Units 2 and 3.

Technical Evaluation: (NUREG-0800) The staff finds the VCSNS Emergency Plan adequately describes the assessment of other nearby hazards that could potentially affect the safety of the VCSNS facility. This is acceptable because it meets the guidance in NUREG-0800.

13.3C.17.7 Security-Based Drills and Exercises

Technical Information in the Emergency Plan: (NUREG-0800) The VCSNS Emergency Plan did not specifically address security-based drill or exercises. In RAI 13.3-50(3), the staff requested additional information on the security-based drill and exercise program. In its response, the applicant stated Section 2.N, “Drill and Exercise Program,” addresses drills and exercises that are conducted to evaluate emergency response capabilities, including demonstration of emergency response to a security-based threat as required by NRC Bulletin 2005-02. Details describing conduct of drills and exercises are located in the Emergency Plan Implementing Procedures. This procedure must be developed to meet the EP ITAAC Section 9.0 acceptance criteria. The staff's technical evaluation of EP ITAAC is addressed in Section 13.3C.19 of this SER.

Technical Evaluation: (NUREG-0800) The staff finds the VCSNS Emergency Plan adequately describes the security-based drill and exercise program. This is acceptable because it meets the guidance in NUREG-0800.

13.3C.17.8 Emergency Preparedness and Response to a Security-Based Event

Technical Information in the Emergency Plan: (NUREG-0800) The VCSNS Emergency Plan did not specifically address the security-based event in the Emergency Preparedness Program. In RAIs 13.3-50(1), (2), and (3), the applicant was requested to provide additional information on the overall emergency preparedness program as it relates to security-based events. In its response, the applicant indicated where security-based responses were stated, where implementing procedures would be developed and identified changes to the VCSNS Emergency Plan. This item is identified as **Confirmatory Item 13.3-7**, pending NRC review and approval of the revised VCSNS COL application.

Resolution of Confirmatory Item 13.3-7

Confirmatory Item 13.3-7 is an applicant commitment to update COL application Part 5, Emergency Plan, to add a discussion regarding security-based responses. The staff verified that the COL application Part 5, Emergency Plan, was appropriately updated. As a result, Confirmatory Item 13.3-7 is now closed.

Technical Evaluation: (NUREG-0800) The staff finds that the VCSNS Emergency Plan adequately describes the emergency preparedness and response to a security-based event program. This is acceptable because it meets the guidance in NUREG-0800.

13.3C.17.9 Conclusions

The NRC staff concludes that the VCSNS Emergency Plan adequately addresses the preparation and response to security-based events program. This is acceptable because it meets the guidance in NUREG-0800.

13.3C.18 Evacuation Time Estimate (ETE) Analysis

The VCSNS Emergency Plan includes an analysis of the time required to evacuate the plume exposure pathway EPZ. The report titled “Virgil C. Summer Nuclear Station Development of Evacuation Time Estimates," dated August 2007, (ETE Report) was provided as a separate

document in the COL application as Appendix 5, "Evacuation Time Estimate Study. The Pacific Northwest National Laboratory and the Sandia National Laboratory assisted the staff in performing a technical review of the ETE Report. The ETE Report includes analyses and responses to RAIs that provide the basis for the NRC staff's conclusions as to the adequacy of its content and conformity with Appendix 4 to NUREG-0654/FEMA-REP-1.

13.3C.18.1 Regulatory Basis for the ETE Analysis

The staff considered the following regulatory requirements and guidance in the review of the evacuation time estimate analysis:

- 10 CFR 52.79(a)(21) refers to Appendix E to 10 CFR Part 50, Section IV, of which "Content of Emergency Plans," requires that the nuclear power reactor operating license applicant provide an analysis of the time required to evacuate and for taking other protective actions for various sectors and distances within the plume exposure pathway EPZ for transient and permanent populations.

The staff evaluated the ETE Report against Appendix 4, "Evacuation Time Estimates within the Plume Exposure Pathway Emergency Planning Zone," to NUREG-0654/FEMA-REP-1. Appendix 4 includes detailed guidance that the staff used in determining whether the ETE analysis meets the applicable regulatory requirements in Appendix E to 10 CFR Part 50.

13.3C.18.2 Introductory Materials Related to the ETE Report

Technical Information in the ETE Report: [Section I of Appendix 4] Section 1, "Introduction," provides a basic description of the process used to estimate evacuation times. A simple description, with map (Figure 1-1, "VC Summer Nuclear Station Site Location"), of the EPZ and surrounding area is provided. Additional information regarding the lack of elevations, surrounding communities, and political boundaries on the map was requested in RAI 13.3-3. In its response, the applicant provided a revised Figure 1-1 that includes labels for the lakes, rivers, and communities in the area. The applicant also provided a revised Figure 1-2 in a larger scale that includes sector, quadrant, and county boundaries. Major roadways, communities, lakes, and rivers have also been labeled. Figures 3-1 and 6-1 were also revised to include county boundaries.

Section 2, "Study Estimates and Assumptions," provides the basis for the population data estimates used in the ETE. Population estimates are based on the 2000 census using the ArcGIS software and the block centroid method. Additional information was requested in RAI 13.3-2(A) to resolve differences in population estimates between the ETE Report, the Environmental Report (ER), and the FSAR. In its response, the applicant stated that ER Section 2.5.1.1 uses a 10-mile radius centered at proposed new Units 2 and 3 to estimate its population. The ETE Report uses a 10-mile radius centered at the existing Unit 1. The EPZ also excludes some areas of the 10-mile zone while including others. These two factors account for the differences in population estimates between the ETE and the ER.

Estimates of employee and special facility populations are based on data provided by county emergency management officials. Auto occupancy factors are based on a statistical analysis of data acquired from a telephone survey. Additional assumptions regarding the development of population estimates, including pass-through populations and regional employees, are provided in Section 3, "Demand Estimation," and Appendix E, "Special Facility Data." Assumptions about transit-dependent and special populations are provided in Section 8, "Transit-Dependent and

Special Facility Evacuation Time Estimates," and Appendix E. Development of trip generation times from survey responses is described in Section 5, "Estimation of Trip Generation Times."

Twelve study assumptions used as the basis for the ETE are provided in Section 2.3, "Study Assumptions." The study assumes that everyone will evacuate according to assigned routes. Schools are to be notified in advance of the general population and are given priority for use of transportation resources. Additional information was requested in RAI 13.3-4(A) with regard to the Assumption #3 concerning the evacuation of school prior to the notification of the general public. In its response, the applicant stated that Assumption #3 does not influence the calculation or results for the ETE and is not feasible under the ETE planning basis. This assumption will be removed in future revisions of the ETE Report. This section will now read:

> 67 percent of households in the EPZ have at least one commuter, 78 percent of which await the return of a commuter before beginning their evacuation trip, based on the telephone survey results.

Buses not being used for school evacuation will be used to transport those without access to private vehicles. Fifty-percent of these people are assumed to ride-share with neighbors or friends. Traffic control points (TCPs) and access control points (ACPs) will be established to aid the flow of traffic out of the plume exposure pathway EPZ. Additional information was requested in RAI 13.3-4(B) and (C) to determine what effect traffic control will have on evacuation time. In its response, the applicant stated that ETE calculations do not rely on any of the traffic control measures identified in Appendix G, "Traffic Management," to enhance or expedite the evacuation. However, the use of TCPs will aid in expediting the movement of transit resources and help with the surveillance of the evacuation operation. The estimates of capacity (Appendix K, "Evacuation Roadway Network Characteristics,"), which are used by the IDYNEV model, are based on the factors described in Section 4 and observations made during the road survey. Capacity estimates are not enhanced nor compromised by the establishment of a TCP at an intersection. The TCPs are to facilitate evacuating traffic movements and discourage travelers from moving closer to the VCSNS. Personnel will also serve a surveillance function to inform the EOC of any problems. Figure 1 of the ETE shows that evacuation is dictated by the mobilization time. The short travel times indicate there is not pronounced traffic congestion within the EPZ. The establishment of TCPs to manage traffic congestion is not necessary; but recommended. There would be no effect on ETE if traffic control points were not established. Thus, the applicant stated that no changes to the ETE are needed due to lack of resources or the regions being evacuated.

Adverse weather is also considered as part of this study. Additional information on the effect of adverse weather was requested in RAI 13.3-4(D). In its response, the applicant stated that the "No Effect" in the table on page 2-5 refers to the mobilization time for the general population. The name of the final column will be changed to "Mobilization Time of the General Population" for clarification. The only portion of this mobilization that involves driving is the time to return home. This occurs prior to the onset of congestion. Reduction in free speed due to weather would not increase travel time. The mobilization times discussed in Section 8 are for transit - dependent persons, schoolchildren, special facility populations, and those without private vehicles. The majority of this time is spent driving; as a result, the reductions of 10 percent in capacity and in speed for rain are assumed to add a total of 10 minutes to the mobilization time, as discussed on page 8-5 of the ETE.

An outline of the approach to estimating the ETE is presented in the Introduction section of the ETE analysis, with a link-node map, Figure 1-2, "V.C. Summer Link-Node Analysis Network," of

the highway network developed through the use of Geographic Information System (GIS) mapping software and field observations. Details of the link-node map are presented in Appendix K, “Evacuation Roadway Network Characteristics.” The IDYNEV system was used to analyze the highway network to determine routes used for evacuation and estimate evacuation times. A description of the IDYNEV system and associated sub-models is provided in Section 1.3, “Preliminary Activities.” The IDYNEV system consists of several submodels - a macroscopic traffic simulation model, an intersection capacity model, and a dynamic, node-centric routing model that adjusts the "base" routing in the event of an imbalance in the levels of congestion on the outbound links. Another model of the IDYNEV System is the traffic assignment and distribution model, which integrates an equilibrium assignment model with a trip distribution algorithm to compute origin-destination volumes and paths of travel designed to minimize travel time. A discussion of algorithms used is provided in detail in Section 4, “Estimation of Highway Capacity.” Additional information on algorithms used in the estimations was requested in RAIs 13.3-5(A), (B), (C) and 13.3-11(C). In RAI 13.3-5(A), the staff requested additional information related to algorithms used by the traffic models. In its response, the applicant stated that information related to models is provided under the "Analytical Tools" sub-heading, and in Appendices B through D of the ETE Report. Further detail of the PC-DYNEV simulation model is found in NUREG/CR-4873, "Benchmark Study of the IDYNEV Evacuation Time Estimate Computer Code," and NUREG/CR-4874, "The Sensitivity of Evacuation Time Estimates to Changes in Input Parameters for the IDYNEV Computer Code." Additional references to papers describing other algorithms are provided as a footnote on page 4-2 of the ETE.

In RAI 13.3-5(B), the staff requested that the applicant provide a discussion of the “various known factors,” mentioned on page 4-2. In its response, the applicant provided a discussion of the process used to determine the value of variables described in Section 4. The applicant stated that the values of the variables in the intersection algorithm in Section 4 were derived by applying the IDYNEV System as an analysis tool rather than as a single "pass-through" calculation of an ETE. This tool was used to identify points of congestion and locations where TCPs could be helpful to the evacuating public. Simulation results were analyzed to identify locations where the green time was specified to realistically service the competing traffic volumes under evacuation conditions. The model was executed iteratively to provide assurance that the allocation of "effective green time" appropriately represents the operating conditions of an evacuation. (Note: Green Time is vehicle movement in/through an intersection.) The mean queue discharge headway in seconds per vehicle is equal to 3600 sec/hr - saturation flow rate, expressed in vehicles per hour. Saturation flow rates are presented in Appendix K, “Evacuation Roadway Network Characteristics,” based on the field survey and the Highway Capacity Manual (HCM) guidance. Examination of Appendix K shows that some of the highway links have a saturation flow rate of 1895 vehicles per hour per lane, exceeding the 1700 vehicles per hour per lane suggested by the HCM 2000. A sensitivity study was run reducing the capacity of these links to 1700 vehicles per hour per lane. Figure 1 attached to this response indicates that the ETE is unaffected by this change. Chapters 10, 16, 17, and 31 of the 2000 HCM were also cited as a reference for additional information.

In RAI 13.3-5(C), the staff requested additional information related to an intersection equation used in the ETE Report. In its response, the applicant stated that the equation presented on page 4-1 of the report applies to signalized and to manually-controlled intersections. No allowance is made for TCP operations. Figure 1, submitted with the response to RAIs 13.3-4 and 13.3-3(B), shows that the mobilization time distribution, not congestion or traffic control, dictates evacuation time. When there are competing traffic movements at an intersection or juncture, the space must be time shared in order to afford safe passage. This process is

implemented in the simulation model by the analyst determining the allocation of effective green. Competing traffic flows may be delayed at the intersection influencing the travel time. Figure 7-4 submitted with the RAI response, illustrates the resulting queuing that can take place as a result of this process when the traffic demand exceeds intersection capacity.

In RAI 13.3-11(C) the staff requested the applicant provide information related to the reduction factor, "R," used in an equation. In its response, the applicant provided a reference to a study performed by Zhang and Levinson. The reference indicates that the variation of queue discharge flow (QDF) at a location is generally in the range of +/- 5 percent about the average QDF. The lower tail of this distribution would be equivalent to a capacity reduction factor of 0.90 - 0.05 = 0.85, which is the figure applied by the IDYNEV system. The ETE Report takes a conservative view in estimating the capacity at bottlenecks when congestion develops by applying a factor of 0.85 only when flow breaks down, as determined by the simulation model. The applicant has provided a revision to page 4-4 that includes a reference to the Zhang and Levinson study.

Further details on the use of traffic models are provided in Appendix C, "Traffic Simulation Model: PC-DYNEV," and Appendix D, "Description of Study Procedure." Because this ETE study supersedes an earlier study performed in 1981 for the existing reactor at the VCSNS site, a list of differences in the approaches is provided in Section 1.4, "Comparison with Prior ETE Study."

Technical Evaluation: [Section I of Appendix 4] The ETE Report includes a map showing the proposed site and plume exposure pathway EPZ, as well as transportation networks, topographical features, and political boundaries. The boundaries of the EPZ, in addition to the evacuation subareas within the EPZ, are based on factors such as current and projected demography, topography, land characteristics, access routes, and jurisdictional boundaries. The EPZ is subdivided into 13 protective action zones (PAZ) that are readily identifiable by local rivers, roads, or other landmarks to the public using them.

The ETE Report describes the method of analyzing the evacuation times. A general description of the evacuation model was provided including the assumptions used in the evacuation time estimate analysis.

The staff finds the clarifications and additional information submitted in response to RAIs 13.3-2(A), 13.3-4(B) and (C), and 13.3-5(A) to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1.

In response to RAI 13.3-3, the applicant has provided revised Figures 1-1, 3-1 and 6-1 regarding the VCSNS site location and Protective Action Zones. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-3 to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-3.

In response to RAI 13.3-4(A), the applicant has committed to remove Assumption #3 regarding evacuation movements from Section 2.3 and to revise the text accordingly. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-4(A) to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-4(A).

In response to RAI 13.3-4(D) the applicant has revised the final column in the table on page 2-5 to "Mobilization Time of the General Population" for clarification. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-4(D) to be acceptable because they clarify the table. This revision conforms to the guidance in NUREG-0654/FEMA-REP-1 and the staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-4(D).

In response to RAI 13.3-5(B), the applicant has committed to change Saturation Flow Rates in Appendix K from 1895 to 1714. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-5(B) to be acceptable because they clarify the table. This revision conforms to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-5(B).

In response to RAI 13.3-11(C), the applicant has committed to add a reference to the Zhang and Levinson study to page 4-4. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-11(C) to be acceptable because the applicant clarified the mathematical formulas used in the ETE Analysis. This revision conforms to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-11(C).

In response to RAI 13.3-5(C), the applicant provided a discussion of the variables for the intersection algorithm in Section 4, “Estimation of Highway Capacity,” which states that the model was executed iteratively to provide assurance that the allocation of effective green time appropriately represents the operating conditions. The response to RAI 13.3-5(C) discusses that this iterative procedure represents a reasonably efficient operation under evacuation conditions. This approach is appropriate, if the traffic control is in place to support a reasonably efficient operation under evacuation conditions. In RAI 13.3-10(B), the staff asked for clarification regarding how the ETE model addressed the movement of vehicles through traffic control intersections and how the traffic management strategy affected ETE calculations. However, the response to RAI 13.3-5(C) indicates that the ETE does, to some extent, rely on traffic control being in place to represent reasonably efficient operation under evacuation conditions. In its response the applicant provided additional clarifying information and advised that the corrections to the ETE had been reviewed and agreed upon by local and state authorities. The staff finds the additional information and textual revisions submitted in response to RAIs 13.3-5(C) and 13.3-10(B) to be acceptable because they clarify the textual information. This revision conforms to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-10(B). Therefore, the staff finds that description of the process used to estimate evacuation times is acceptable because it conforms to the guidance in Section I of Appendix 4 to NUREG-0654/FEMA-REP-1.

13.3C.18.3 Demand Estimation

Technical Information in the ETE Report: [Section II of Appendix 4] Section 3, “Demand Estimation,” provides an estimate of demand expressed in terms of people and vehicles. The permanent resident population to conduct the ETE analysis was projected out to 2007 by comparing the local 2005 census assessment with the 2000 official census to obtain growth

rates for each county. Additional information was requested in RAI 13.3-2(C) to resolve differences in population growth rates between the ETE Report and the U.S. Census. In its response, the applicant stated that data was obtained from the U.S. Census Bureau website at http://quickfacts.census.gov on November 1, 2006, and December 12, 2008. Annual growth rates calculated for each county were based on these population estimates. Comparisons with estimates in the ER show that they are in agreement.

Based on information obtained in a telephone survey, the permanent resident average household size is estimated at 2.68 persons per household with 1.49 vehicles per household. Estimates of the permanent resident population and their vehicles are presented for each of the 13 PAZs in Table 3-2, "Permanent Resident Population and Vehicles by PAZ," and by polar coordinate representation in Figures 3-2, "Permanent Resident by Sector," and Figure 3-3, "Permanent Resident Vehicles by Sector." In RAI 13.3-2(D)(1-4), the staff requested that the applicant explain differences in population estimates between the ETE Report and State and local plans. In its response, the applicant stated that populations in the ETE Report use the 2000 U.S. Census "blockpop" GIS point shapefile. A description for the use of this system in estimating the 2007 PAZ populations was provided. Data used in the Richland County and Lexington County Emergency Response Plans are based on the estimates made in 1993 based on the 1990 census data. The ETE Report is based on 2007 estimates.

The transient population estimate is based on data provided by South Carolina Department of Parks, Recreation, and Tourism (SCDPRT). It is estimated that 320 people could be recreating within the VCSNS plume exposure pathway EPZ on a peak day. Of these, 90 percent are residents and 10 percent transients. A conservative value of 20 percent was applied to the transient population with an increase of 12 persons to account for rounding. The resultant transient population is 76 persons. Individual activity vehicle occupancy factors were used to estimate average vehicle occupancy of 2.14 transient per vehicle. Estimates of the transient population and their vehicles are presented by polar coordinate representation in Figures 3-4, "Transient Population by Sector," and Figure 3-5, "Transient Vehicles by Sector." In RAI 13.3-7(A), the staff requested additional information on increases in the transient populations due to local holiday celebrations. In its response, the applicant stated that a sensitivity study was conducted to assess the impact on ETE of the influx of transients for the Chapin Labor Day Festival. There are 10,000 people present during peak times at the festival of which 20 percent are transients. The results of the sensitivity study indicate that the ETE for the entire EPZ (Region R03) is not affected by the influx of transients for the festival. The results of this study were included in a draft of the revised Appendix I. The applicant included the new results in the ETE Report.

Employees who commute to jobs within the plume exposure pathway EPZ are assumed to evacuate along with the permanent resident and transient populations. Only two major employers, VCSNS and Ellett Brothers-Sporting Goods Equipment Distributors, are within the plume exposure pathway EPZ. Vehicle occupancy of 1.01 is used for the employee population. Estimates of the employee vehicles are presented by polar coordinate representation in Figures 3-7, "Employee Vehicles by Sector." In RAI 13.3-7(B), the staff requested that the applicant provide Figure 3-6, "Employee Population by Sector," which was omitted. In its response, the applicant updated the ETE which identifies the employee population by sector.

One special event scenario, Scenario 12, is included. Scenario 12 represents the peak construction period for Units 2 and 3 during a typical summer, midweek, and midday, under good weather conditions. The peak construction period is estimated by SCE&G to begin in the year 2014. Population estimates for permanent residents and transients were extrapolated out

to 2014, based on county growth rates. An estimated 3,600 workers and their vehicles were also included in Scenario 12. Additional information regarding population projections for the construction period was requested in RAI 13.3-2(B). In its response, the applicant stated that only the permanent resident and shadow populations were extrapolated to 2014. It is assumed that no major transient attractions or major employers would be introduced between 2007 and 2014, so these population estimates were not extrapolated. The 2014 permanent resident populations are estimated to be 12,470 using county-specific growth rates. The estimated shadow population would be 44,096.

Permanent residents, transients, and employees make up the general population. Vehicles traveling through the plume exposure pathway EPZ (external-external trips) are assumed to continue to enter during the first 60 minutes following an accident. Subsequently, none enter and those remaining will evacuate with the general population. Population estimates for special facilities and people without personal vehicles are provided in Section 8, “Transit-Dependent and Special Facility Evacuation Time Estimates.” There are seven pre-schools, five elementary schools, two middle schools and three high schools within the plume exposure pathway EPZ. In RAI 13.3-8(A), the staff requested that the applicant explain the use of pre-schools in the ETE. In its response, the applicant stated that vehicles used to pick up these children were included. The mobilization time estimates also include picking up children at day care centers. Table 1 summarizes the transportation assets for each day care center, based on a survey of these facilities. Some of the larger day care centers have vans or buses that can be used to evacuate children not picked up in a timely manner. Adding these vehicles will not impact the ETE of the general population. The applicant has committed to including a discussion of day care facilities in Section 8.3 in a future revision of the ETE Report. This section will include the following paragraph:

> Day-care centers are neighborhood facilities that service local children that are dropped off in the morning and picked up subsequently by parents or designees. Since the estimated resident vehicle population is based on household size and on vehicles per household, the vehicles used to pick up these children for evacuation have already been included in the estimate of evacuating vehicles. The mobilization time estimates (Section 5) are based on the telephone survey which reflects the daily activities of EPZ residents, including the picking up of children. Therefore, separate ETE are not provided for day-care centers. A survey of day-care centers within the EPZ was conducted: some of the larger day care centers have vans or buses. While this transport is not capable of servicing all children at these facilities, they can be used to evacuate any children not picked up in a timely manner.

There is only one special care facility, Generations of Chapin Nursing Home, within the 10-mile plume exposure pathway EPZ. There are no hospitals or jails located within the EPZ. The staff requested additional information on special needs individuals in the area in RAI 13.3-8(C). In its response, the applicant stated that recent communication with the counties has yielded data concerning registered homebound special needs population within the VCSNS EPZ. Based on capacities, the applicant identified transportation resources necessary to evacuate the homebound special needs population. The EPZ counties are parties to the South Carolina state-wide mutual aid agreement, which outlines procedures and policies regarding the delivery of ambulances, wheelchair vans and buses. If a county lacks sufficient resources, they will be provided through this state-wide agreement. The applicant submitted additional information related to the evacuation of special needs persons that revised Section 8.4, "Special Needs Population."

A separate map is provided indicating recreational areas in Appendix E, “Special Facility Data.” In RAI 13.3-8(B), the staff requested that the locations of special facilities be added to this map. In its response, the applicant stated that the figure on page E-8 of the ETE Report will be renamed Figure E-1, “Recreational Areas within the VCSNS EPZ.” The figure has been updated to include the names of the recreational areas and was enclosed with this response. Figure E-2, “Schools within the VCSNS EPZ,” and Figure E-3, “Major Employers, Medical Facilities and Day Care Centers within the VCSNS EPZ,” were also included and were added to Appendix E, pages E-9 and E-10, respectively. Figures E-1, E-2, and E-3 collectively provide the locations of all special facilities relative to the location of the VCSNS site.

Telephone survey results (reported in Appendix F, “Telephone Survey”) are used to estimate the portion of the population requiring transit service. The transit-dependent population includes persons in households without vehicles and persons in households whose vehicles are unavailable at the time of evacuation due to commuter use. In RAI 13.3-6, the staff requested additional information to clarify the inconsistent use of the percentage of households with commuters. In its response, the applicant stated that the results of the telephone survey indicate that 67 percent of households have at least one commuter. The value of 33 percent is the number of households that do not have a commuter, as indicated in column 3 of Table 6-3. The telephone survey further indicates that 78 percent of those households with a commuter will await the return of the commuter prior to evacuating. The number of households with a commuter who will not await the return of the commuter is 22 percent. This value was used to estimate the number of transit-dependent persons in the EPZ, as shown in the formula on Section 8. The applicant revised Section 2.3 to read:

> It is further assumed that 67 percent of households in the EPZ have at least one commuter, 78 percent of which await the return of a commuter before beginning their evacuation trip, based on the telephone survey results.

It is assumed that half of the 444 estimated people without transportation would ride-share with friends or neighbors, but that a residual 222 persons would require assistance to evacuate. Additional information regarding the estimation of this population group was requested in RAI 13.3-8(D) and (E). In RAI 13.3-8(D), the staff requested that the applicant clarify whether employees and transients were considered in the transit-dependent population estimate as stated in the text. In its response, the applicant stated that the study assumes all transients and employees will have private vehicles available for evacuation due to the lack of mass transit services. Therefore, employees and transients will not require transit resources for evacuation. The first paragraph of Section 8 was revised to reflect this assumption.

In RAI 13.3-8(E), the staff requested that the applicant clarify the value used to represent the number of households with two vehicles. In its response, the applicant stated that the data in Table 8-1, “Transit Dependent Population Estimates,” showing that 38.5 percent of households have two vehicles are accurate. The 58 percent shown in the calculation on page 8-3 is a typographical error. However, the results of the calculations shown in the second and third lines of the equation are correct. The applicant has revised the equation and text on page 8-3 to reflect the correct value of 38.5 percent.

The total number of people expected to evacuate for each scenario and vehicles to be used is discussed in Section 6, “Demand Estimation for Evacuation Scenarios.” The VCSNS plume exposure pathway EPZ contains 13 PAZs with boundaries along major roads or rivers. The boundary definitions are provided in Appendix L, “Protective Action Zone Boundaries.”

Evacuation will be performed by regions that include multiple PAZs. These regions approximate (by radius/area): two miles/four 90-degree sectors, five miles/four 90-degree sectors, 10-miles (EPZ)/four 90-degree sectors, and 10-miles (EPZ)/entire EPZ. A description of the evacuation regions and their associated PAZs can be found in Table 6-1, "Description of Evacuation Regions."

A description of the evacuation scenarios used for this study can be found in Table 6-2, "Evacuation Scenario Definitions." The percentages of population groups expected to evacuate for each scenario are described in Table 6-3, "Percentage of Population Groups for Various Scenarios." Additional information on Table 6-3 was requested in RAI 13.3-9(B). In its response, the applicant stated that the numbers presented in Table 6-4, "Vehicle Estimates by Scenario," are for evacuation of the full EPZ. Voluntary evacuation percentages are not applied in obtaining the numbers in Table 6-4 because all PAZs evacuate 100 percent. The vehicle totals represent the upper bound of vehicles evacuating for a given scenario. The applicant has provided Table H-1, "Percent of ERPA Population Evacuating for Each Region," which identifies the voluntary evacuation percentages for each PAZ for each Regional configuration. This table was added to Appendix H.

Technical Evaluation: [Section II of Appendix 4] The ETE Report provides an estimate of the number of people who may need to evacuate. Three population segments are considered: permanent residents, transients, and persons in special facilities. The permanent population is adjusted for growth, and the population data is translated into two groups: those using automobiles and those without automobiles. The number of vehicles used by permanent residents is estimated using an appropriate automobile occupancy factor. In addition, evacuation time estimates for simultaneous evacuation of the entire plume exposure pathway EPZ were determined.

Estimates of transient populations were developed using local data including peak tourist volumes and employment data. Estimates for special facility populations are also provided.

The subareas, for which evacuation time estimates were determined, encompass the entire area within the plume exposure EPZ. The maps are generally adequate for the purpose, and the level of detail is approximately the same as United States Geological Survey (USGS) quadrant maps. The assumptions on evacuation are based on simultaneous evacuation of inner and outer sectors. The staff finds the clarifications submitted in response to RAI 13.3-2(C) and (D)(1-4) to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1.

In response to RAI 13.3-7(A), the applicant provided a revision to Appendix I, "Evacuation Sensitivity Studies," to include an analysis of the effect of transient influx due to the Chapin Festival. The applicant also provided a new Table I-1, Evacuation Time Estimates for Trip Generation Sensitivity Study," and Table I-3, "Evacuation Time Estimates for Evacuating Vehicles per Household Sensitivity Study". The staff finds the additional information and textual revisions submitted in response to RAI 13.3-7(A) regarding the effect of population flux due to special events to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-7(A).

In response to RAI 13.3-7(B), the applicant provided Figure 3-6, "Employee Population by Sector," which was omitted from the ETE Report. The applicant also provided a new Table I-1,

"Evacuation Time Estimates for Trip Generation Sensitivity Study," and Table I-3, "Scenario 3 (Base) and Scenario 14 (Labor Day Festival) ETE for Region 3." The staff finds the additional information and textual revisions submitted in response to RAI 13.3-7(B) to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-7(B).

In response to RAI 13.3-8(A), the applicant provided revised text for Section 8.3 to discuss the evacuation of day-care centers. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-8(A) to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-8(A).

In response to RAI 13.3-8(C), the applicant provided revised text for Section 8 to discuss the evacuation of special needs individuals that will be included in a new Section 8.4, "Special Needs Population," on page 8-8. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-8(C) to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-8(C).

In response to RAI 13.3-8(B), the applicant provided revised Figure E-1 and new Figures E-2 and E-3 to identify special facilities in the EPZ. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-8(B) to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-8(B).

In response to RAI 13.3-6, the applicant provided a revision to the text in Section 2.3 to address the number of households that have commuters. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-6 to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-6.

In response to RAI 13.3-8(D), the applicant provided a revision to the first paragraph in Section 8 to omit the statement about the use of transit resources by transients and employees. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-8(D) to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-8(D).

In response to RAI 13.3-8(D), the applicant provided a revision to the text and equation on page 8-3 that incorrectly identified a value of 58 percent instead of 38.5 percent. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-8(D)(2) be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-8(D)(2).

In response to RAI 13.3-9(B), the applicant provided a new Table H-1 which identifies the voluntary evacuation percentages for each PAZ for each Regional configuration. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-9(B) to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-9(B).

In response to RAI 13.3-2(B), the applicant stated that the ETE Report assumes that no major transient attractions or major employers would be introduced between 2007 and 2014, so these population estimates were not extrapolated. The applicant also provided additional information on the permanent resident and shadow estimated populations for 2014. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-2(B) to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-2(B).

The staff finds the ETE Report adequately addresses the estimate of the number of people who may need to be evacuated. This is acceptable because it conforms to the guidance in Section II of Appendix 4 to NUREG-0654/FEMA-REP-1.

13.3C.18.4 Traffic Capacity

Technical Information in the ETE Report: [Section III of Appendix 4] Section 4, “Estimation of Highway Capacity,” describes the process used to determine vehicle capacities for roadways in the transportation network. The methods used are generally taken from the HCM published by the Transportation Research Board of the National Research Council. Appendix K, "Evacuation Roadway Network Characteristics," identifies all evacuation route segments and their characteristics, including capacity. A map of the transportation network is provided in Figure 1-2, “Summer Link-Node Analysis Network.” Additional information describing the road network used for evacuation routes was requested in RAI 13.3-10(A). In its response, the applicant provided a 48-inch by 36-inch PDF file of Figure 1-2 that includes the node numbers from Appendix K, sector, quadrant and county boundaries.

The ETE Report states that the characteristics of each section of the highway were recorded during field surveys. These included unusual characteristics, such as narrow bridges, sharp curves, poor pavement, flood warning signs, inadequate delineations, etc. These areas were not identified in the report. In RAIs 13.3-11(A) and (B), the staff requested additional information regarding unusual roadway characteristic and highway lane widths. In its response, the applicant stated that the term "full lanes" is used to identify the number of lanes that extend over the entire length of the roadway segment or link. Many network links are widened with additional lanes near the downstream intersection and are all properly represented in the input stream for the IDYNEV system. The estimation of capacity is based on the narrowest section of the roadway segment. The free-flow speed (Appendix K) is based on observation of traffic movements during the field survey. Lane widths were observed but not measured during the field survey. The number of bridges, sharp curves, narrow shoulders and other capacity-reducing features on the evacuation network were observed and considered in estimating capacity. The applicant also provided a discussion for how the model uses roadway characteristics to adjust traffic flow. In any case, mobilization time dictates the ETE. There is excess capacity within the EPZ, and the reduced capacities on the narrowest road segments have no effect on ETE.

Section 9, "Traffic Management Strategy," presents a traffic control and management strategy that is designed to expedite the movement of evacuating traffic. The traffic management strategy is based on a field survey of critical locations and consultation with emergency management and enforcement personnel. Appendix G, “Traffic Management,” provides a description of TCPs and ACPs and provides maps of their location within the plume exposure pathway EPZ (Figure G-1, “VC Summer Traffic Control Points” and Figure G-2, “VC Summer Access Control Points”). Additional information regarding the use of the traffic management strategy was requested in RAIs 13.3-10(B) and (C). In RAI 13.3-10(B), the staff requested that the applicant explain the use of TCPs and ACPs. In its response, the applicant stated that ETE calculations do not rely on any of the traffic control measures identified in Appendix G. The estimates of capacity, which are used by the IDYNEV model and are documented in Appendix K, are based on the factors described in Section 4 and on the observations made during the road survey. The applicant further stated that TCPs could be used to facilitate evacuating traffic movements and discourage travelers from moving closer to the VCSNS. Personnel manning TCPs will also serve a surveillance function to inform the EOC of any problems. As illustrated in Figure 1, the ETE for the VCSNS EPZ is dictated by the mobilization time. The short travel times indicate there is not pronounced traffic congestion within the EPZ delaying the departure of evacuees from the EPZ. The establishment of TCPs to manage traffic congestion is not necessary, but recommended to provide guidance, reassurance, fixed point surveillance. There would be no effect on ETE if traffic control points were not established.

In RAI 13.3-10(C), the staff requested that the applicant explain the effect of reentry on the ETE. In its response, the applicant stated that Assumption #6 in Section 2.3 indicates that ACPs are staffed one to two hours after the advisory to evacuate (ATE). The inputs to the model indicate that traffic stops entering the EPZ at 90 minutes after the ATE. Figure F-10, “Work to Home Travel Time,” indicates that approximately 99 percent of the EPZ population could travel home from work in 90 minutes or less, justifying the use of 90 minutes. The assumed 90 minute timeframe for allowing entry into the EPZ was reviewed by the EPZ counties as they were presented with the ETE Report prior to the COL application submittal. The applicant has revised Assumption #6 and the footnote on page 6-5 to eliminate the reference estimate of one to two hours following notification and replaced it with the correct estimate of 90 minutes. A revision to Assumption #7 was also provided.

Section 10, “Evacuation Routes,” illustrates the emergency evacuation routes for the four counties surrounding the VCSNS site. Evacuation routes provide for evacuation first to the EPZ boundary and then to reception centers. The TRAD model was used to determine routes that would minimize exposure to risk by balancing traffic demand relative to road capacity. Evacuation routes were also developed to minimize travel outside the EPZ and relate traffic volume to reception center capacity. Section 7.2, “Patterns of Congestion,” identifies areas of traffic congestion that arise for the case when the entire EPZ (Region R3) is advised to evacuate during the summer, weekend, and midday period under good weather, in Figure 7-3, “Congestion Patterns at 2 Hours after the Order to Evacuate (Scenario 1),” and Figure 7-4, “Congestion Patterns at 2 Hours after the Order to Evacuate (Scenario 12).” Additional information regarding travel times and delay durations was requested in RAI 13.3-15 and 13.3-8(E)(1-3). In RAI 13.3-9(E)(1), the staff requested that the applicant provide maps that include queuing locations and estimated delay times. In its response, the applicant stated that there is no significant traffic congestion during evacuation for all Year 2007 Scenarios (1 through 11). There is congestion for the Construction Scenario (Scenario 12) due to the large influx of vehicles transporting workers for the construction of Units 2 and 3. The applicant has revised the second paragraph on page 7-3 of the ETE Report to read:

> There is no significant congestion within the EPZ for all Year 2007 cases (Scenarios 1 through 11); consequently the ETE reflects the mobilization activities of the EPZ population. There is congestion under Scenario 12 conditions (peak construction - Year 2014); however all congestion within the EPZ is clear by 3 hours and 20 minutes after the advisory to evacuate. Therefore, the 100th percentile ETE for Scenario 12 is also dictated by mobilization time. Specifically, as detailed in Table 7-1 D, the ETE for 100% of the population approximates the time required for those relatively few persons who need up to 4 hours to mobilize for the evacuation trip. Any decrease in this mobilization time will translate to a commensurate reduction in ETE. The recommendations in Section 13 address this issue.

In RAI 13.3-9(E)(2), the staff requested that the applicant clarify how potential congestion will be managed. In its response, the applicant stated that congestion within the EPZ clears by three hours and 20 minutes after the advisory to evacuate for Scenario 12; therefore, the ETE for the 100th percentile is still dictated by the mobilization time of four hours. The applicant has provided additional information to describe the buildup of congestion points and the use of ACPs and TCPs to reduce congestion. Implementation of these ACPs and TCPs will help manage congestion during construction, but the ETE is not dependent on them being established.

In RAI 13.3-9(E)(3), the staff requested that the applicant clarify the effect congestion will have on the ETE. In its response, the applicant stated that congestion under Scenario 12 conditions increases the ETE by 15 and 10 minutes for the 50th and 90th percentiles of EPZ population, respectively. The ETE for the 95th percentile is 10-minutes less for Scenario 12 than it is for Scenario 1. Therefore, the ETE for the 95th and 100th percentiles are not affected by the congestion caused by construction worker vehicles. Following review of output files, the applicant determined that the 95th percentile ETE for Scenario 12, Region R03 should be 3:20. The applicant has provided revised Tables 7-1D, “Time to Clear the Indicated Area of 95% of the Affected Population,” and J-1D, “Time to Clear the Indicated Area of 100% of the Affected Population,” to reflect this correction.

In RAI 13.3-15, the staff requested that the applicant provide maps that include queuing locations and estimated delay times. In its response, the applicant stated that Figures 7-3, “Congestion Patterns at 2 Hours after the Order to Evacuate (Region 3, Scenario 1),” and 7-4, “Congestion Patterns at 2 Hours after the Order to Evacuate (Region 2, Scenario 13),” have been revised. The major roads in the study area have been identified on the map. The major congestion points in the study area have been labeled with an identification number. Table 7-3, “Description of Congestion Points in Figures 7-3 and 7-4,” provides a description of each congestion point and the link from Figure 1-2, “Summer Link-Node Analysis,” corresponding to that area of congestion. Estimates of the average delay in minutes per vehicle are provided in the Table 7-3, for each of the congestion points. The delay presented is over the previous 10 minutes of simulation. For example, Figure 7-4 shows the congestion patterns at 2 hours after the Advisory to Evacuate for Scenario 13. The average delay for each link provided in the table (column 6) applies to the 10 minute time interval from 110 to 120 minutes after the Advisory to Evacuate. Therefore, the vehicles occupying the link from node 168 to node 8 experience an average delay of 1.8 minutes during this 10-minute interval. Table 7-3 was added to page 7-16 of the revised ETE Report.

In RAI 13.3-11(B), the staff asked the applicant to clarify the road characteristics. A detailed discussion is provided on the application of field data into the calculation and states that bridges

are treated as links in the network. The inclusion of the large scale nodal map supports review of the integration of highway characteristics and some bridges are clearly defined as links in the roadway network. However, there is a bridge located between nodes 185 and 186 and there are two bridges between nodes 171 and 172. The discussion in the response to RAI 13.3-11(B) indicates that these bridges should be identified as separate links in the system to account for their unique characteristics. In RAI 13.3-11(B), the staff asked for clarification regarding whether two bridges should be identified as separate links in the system to account for their unique characteristics. In its response, the applicant provided additional information that explained that the bridges should be considered separate links and revised text was added to the ETE Report.

In RAI 13.3-10(B), the staff asked for clarification regarding how the ETE model addressed the movement of vehicles through traffic control intersections and how the traffic management strategy affected ETE calculations. However, the response to RAI 13.3-5(C) indicated that the ETE does, to some extent, relies on traffic control being in place to represent reasonably efficient operation under evacuation conditions. In its response, the applicant provided additional clarifying information and stated that the corrections made to the ETE had been reviewed and agreed upon by local and state authorities.

Technical Evaluation: [Section III of Appendix 4] The ETE Report provides a complete review of the evacuation road network. Analyses are made of travel times and potential locations for congestion. The evacuation time estimates are not dependent on the establishment of traffic control points and access control points. Therefore, manpower and equipment shortages have no effect on the evacuation time estimate calculations. In addition, all evacuation route segments and their characteristics, including capacity, are described.

A traffic control and management strategy that is designed to expedite the movement of evacuating traffic is described. The traffic management strategy is based on a field survey of critical locations and consultation with emergency management and enforcement personnel. The applicant also analyzed travel times and potential locations for serious congestion along the evacuation routes and found none would be expected. The staff finds the additional information submitted in response to RAIs 13.3-9(E)(2), 13.3-10(A), and 13.3-11(A), regarding congestion and the impact of TCPs and ACPs on the evacuation process, to be acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

In response to RAI 13.3-10(C), the applicant revised Assumption #6 on page 2-4 and the footnote on page 6-5 to eliminate the estimate of one to two hours following notification and replaced it with the correct estimate of 90 minutes. A revised Assumption #7 on page 2-4 was also provided. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-10(C), which clarified the textual information to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-10(C).

In response to RAI 13.3-9(E)(1), the applicant revised the second paragraph on page 7-3 to discuss congestion in Scenario 12. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-9(E)(1), which clarified the textual information to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-9(E)(1).

In response to RAI 13.3-9(E)(3), the applicant determined that the 95th percentile ETE for Scenario 12, Region R03 should be 3:20. The applicant has provided revised Tables 7-1 D and J-1 D to reflect this correction. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-9(E)(3), which clarified the textual information to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-9(E)(3).

In response to RAI 13.3-15, the applicant has revised Figures 7-3 and 7-4 to include congestion point labels to match Table 7-3 and identify major roads. Table 7-3 will also be added to page 7-16. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-15, which clarified the textual information to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-15.

In response to RAI 13.3-10(B), the applicant provided additional clarifying information and advised that the corrections to the ETE had been reviewed and agreed upon by local and state authorities. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-10(B), which clarified the textual information to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-10(B).

In response to RAI 13.3-11(B), the applicant provided additional information that explained that the bridges should be considered separate links and revised text was proposed for the ETE Report. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-11(B), which clarified the textual information to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-11(B).

The staff finds the ETE Report adequately describes the highway capacity estimates. This is acceptable because it conforms to the guidance in Section III of Appendix 4 to NUREG-0654/FEMA-REP-1.

13.3C.18.5 Analysis of Evacuation Times

Technical Information in the ETE Report: [Section IV of Appendix 4] Sections 4, 5, and 6 of the ETE Report describe the methods used to estimate the evacuation times. Section 4, "Estimation of Highway Capacity," describes how data collected during field surveys of the transportation network were combined with methods suggested in the 2000 HCM. Section 5, "Estimation of Trip generation Time," provides estimates of the four different distributions of elapsed times associated with mobilization activities undertaken by the public to prepare for the evacuation trip. The elapsed time associated with each activity is represented as a statistical distribution reflecting differences between members of the public. Additional information regarding evacuation activity distributions was requested in RAIs 13.3-7(C) and (D), 13.3-13(B), 13.3-14(A) and (D). In RAI 13.3-7(C) the staff requested additional information related to the logistics for evacuating the reservoir. In its response, the applicant identified three major boat ramps located on the Monticello Reservoir. Page 3-8 of the report states the SCDPRT estimated that approximately 90 percent of the people at recreational areas are residents and

10 percent are transients. Thus, the majority of the people are familiar with the evacuation procedures through public information distribution. Section 2.G, “Public Education and Information,” states that the EPIO publication for the VCSNS is updated annually, in coordination with state and county agencies, to address how the general public is notified and what their actions should be in an emergency. SCE&G distributes the publication annually to all residents within the 10-mile plume exposure EPZ and to appropriate locations where a transient population may obtain a copy. Table 6-3, “Percent of Population Groups for Various Scenarios,” of the report shows the majority of residents are home during summer weekends when peak populations on the reservoir are expected. Thus, Distribution 4 of Table 5-1, “Event Sequence for Evacuation Activities,” is applicable; this distribution extends over four hours. It is reasonable to assume that boaters on the reservoir will be able to return to boat launch sites, trailer their boats and begin to evacuate the area within this time frame.

In RAI 13.3-7(D), the staff requested additional information related to transient mobilization activities depicted in Figure 5-1, ‘Events and Activities Preceding the Evacuation Trip,”. In its response, the applicant stated that the mobilization distribution for transients extends over a period of 2½ hours, as shown in Table 5-1. Those who elect to return to collect their belongings will be able to do so and then evacuate. The existing Figure 5-1 has been revised; the diagrams for scenarios (b) and (d) do not include those households with employees who work during the evening or on weekends. The applicant revised Figure 5-1 to clarify its meaning. The final paragraph on page 5-3 was revised to read:

> A household within the EPZ that has one or more commuters at work, and will await their return before beginning the evacuation trip, will follow the first sequence of Figure 5-1 (a). A household within the EPZ that has no commuters at work, or that will not await the return of any commuters, will follow the second sequence of Figure 5-1 (a), regardless of day of week or time of day. Note that event 5, "Leave to evacuate the area," is conditional either on event 2 or on event 4. For this study, we adopt the conservative posture that all activities will occur in sequence. Households with no commuters on weekends or in the evening/night-time will follow the applicable sequence in Figure 5-1 (b). Transients will always follow one of the sequences of Figure 5-1 (b). Some transients away from their residence could elect to evacuate immediately without returning to the residence, as indicated in the second sequence.

In RAI 13.3-13(B), the staff requested that the applicant explain how data was normalized to distribute the “don’t know” response. In its response, the applicant stated that a review of the survey instrument reveals that several questions have a “don't know” or “refused” entry for a response. It is accepted practice to accept these answers for a few questions. To address this issue, the practice is to assume that the distribution of these responses is the same as the underlying distribution of the positive responses. In effect, the “don't know” responses are ignored and the distributions are based on the positive data that is acquired.

In RAI 13.3-14(A), the staff requested the applicant to provide the basis for the statement that 85 percent of the population within the EPZ will be aware of the accident within 30 minutes. In its response, the applicant stated that the notification distribution is assumed based on the presence of the siren alert system. The discussion of Distribution #1 on page 5-4 was revised to indicate that the distribution is assumed. This design objective is in agreement with the assumed notification distribution provided on page 5-4 of the ETE Report.

In RAI 13.3-14(D), the staff requested the applicant discuss whether the curves in Figure 5-3, “Comparison of Trip Generation Distributions,” are intended to approach 100 percent, or whether the elapsed time axis should be extended. In its response, the applicant stated that the response to RAI 13.3-9(C) identifies that the curves in Figure 5-2, “Evacuation Mobilization Activities,” and Figure 5-3 do not reflect the results of the procedure discussed in the response whereby the trip generation of the stragglers is advanced. The applicant has provided revised figures in response to RAI 13.3-9(C).

The quantification of activity-based distributions in Section 5 relies largely on the results of a telephone survey included in Appendix F, “Telephone Survey.” In RAI 13.3-14(C), the staff requested that the applicant explain how the data in Figure F-11, “Time to Prepare Home for Evacuation,” were used in the development of the ETE. In its response, the applicant stated that as noted in the response to RAI 13.3-9(C), Distribution #4 on page 5-8 of the ETE Report was revised to reflect the results of the trip generation truncation procedure identified in the response. The distribution was input correctly to the simulation model; however, the distribution was not properly documented in the ETE Report.

Section 6, “Demand Estimation for Evacuation Scenarios,” defines the various evacuation cases for which time estimates were made; a case is a combination of a scenario and a region. A scenario is a combination of circumstances, including time of day, day of week, season, and weather conditions. Scenarios define the number of people in each of the affected population groups and their respective mobilization time distributions. A region is defined as a grouping of contiguous evacuation PAZs, which forms either a "keyhole" sector-based area, or a circular area within the plume exposure pathway EPZ, that must be evacuated in response to a radiological emergency. Reception centers are shown on maps in Section 10, “Evacuation Routes.” The assumptions on evacuation are based on simultaneous evacuation of inner and outer sectors.

A summary of the ETE is provided in Section 7, “General Population Evacuation Time Estimates (ETE).” These results cover 21 regions within the VCSNS EPZ and the 12 evacuation scenarios discussed in Section 6, “Demand Estimation for Evacuation Scenarios.” The evacuation times are presented for 21 evacuation regions and 12 scenarios in Appendix J, “Evacuation Time Estimates for All Evacuation Regions and Scenarios and Evacuation Time Graphs for Region R03, for all Scenarios.” Results are presented for 50 percent, 90 percent, 95 percent, and 100 percent of vehicles. Additional information on evacuation times was requested in RAIs 13.3-9(C), 13.3-14(B). In RAI 13.3-9(C), the staff requested that the applicant explain how the distribution in Section 5, “Estimation of Trip Generation Time,” was derived using the telephone survey information. In its response, the applicant stated that Figure F-11, “Time to Prepare Home for Evacuation,” shows about 99 percent of respondents complete the home preparation within 4 hours, with the remaining stragglers requiring another two hours. Truncating the cited distribution at four hours ensures that these ETE of interest (i.e., 90th and 95th percentiles) are based on a conservative estimate of traffic demand. Advancing the departures of the stragglers to four hours provides assurance that the traffic demand includes all evacuees over that time frame when congested conditions could arise. Since traffic flow is generally a first-in-first-out (FIFO) process, any "tail truncation" that occurs well after the 90th and 95th percentile ETE does not influence these values. The applicant sited NUREG/CR-6953, “Review of NUREG-0654, Supplement 3, "Criteria for Protective Action Recommendations for Severe Accidents," Vol. 2, as a reference. The applicant also provided, "Procedure for Estimating Mobilization Curve Based on Survey Data," which discusses the methodology for advancing the trip generation times of those persons who take longer to mobilize.

In RAI 13.3-14(B), the staff requested that the applicant explain the factors that cause the ETE for Scenario 5, in Table 7-1C, to be longer than all other summer scenarios including Scenario 2. In its response, the applicant stated that as indicated in the response to RAI 13.3-14(B), the ETEs for all cases are reflective of mobilization time. Table 5-1 presents the mobilization time of the evacuating vehicles for each time period for Scenarios 3, 4 and 5. The "Cumulative Vehicles Mobilized" is calculated using the vehicle totals and the trip generation rates provided in Table 5-1. Figure 5-1 presents the time distribution of mobilized vehicles. The mobilization curve for Scenarios 3 and 4 is significantly steeper than that for Scenario 5. This difference reflects the fact that the majority of the vehicles evacuating in Scenario 5 are resident vehicles with longer mobilization times than employees and transients. Scenario 5 has 199 evacuating vehicles, 137(69 percent) of which are residents. Scenarios 3 and 4 have 607 evacuating vehicles, 137(23 percent) of which are residents. Therefore, the ETE time distribution for Scenario 5, which tracks that of the mobilization time, is longer at the 50th, 90th and 95th percentiles than that for Scenarios 3 and 4.

Results are provided for good and adverse conditions. Additional information concerning the possible impacts on evacuation time caused by adverse weather conditions was requested in RAIs 13.3-12(A), (B), and (C). In RAI 13.3-12(A), the staff requested that the applicant explain why icy conditions were not included in the evaluation. In its response, the applicant stated that the ice weekend/evening scenario not being included was an oversight. Scenarios 11 and 12 will be renumbered as Scenarios 12 and 13 and a new Scenario 11 (winter weekend/evening with ice), will be added. Scenarios 9, 10 and 11 (all winter, weekend scenarios) will appear in adjoining columns in the ETE tables (7-1A through D) so that a rapid assessment of the effect of rain and ice on the ETE can be made. The applicant added that rain is estimated to reduce the free speed and capacity of all links in the analysis network by 10 percent, while ice reduces the free speed and capacity by 20 percent. The only difference between the weekday and weekend rain scenarios is the number of people evacuating, as shown in Table 6-4. The weekend and the evening scenarios are similar in that most commuters are home, as shown in Table 6-3. The applicant revised Table 6-2 "Evacuation Scenario Definitions," Tables 7-1 A through D, and the table on page 2-5 to reflect this change. All references to "l 2 scenarios" were also changed to "l 3 scenarios."

In RAI 13.3-12(B), the staff requested that the applicant explain why only Regions 12 and 13 are affected by ice when evacuating 50 percent and 90 percent of the population. In its response, the applicant stated that the input files were reviewed, and the capacity reduction used was actually 20 percent, not 15 percent. Rain and ice do not influence the ETE because the volume of traffic following the Advisory to Evacuate never attains a level where capacity is a factor in influencing travel time even when reduced by inclement weather. The applicant sited various sections of the ETE Report and provided an explanation of the PC-DYNEV model to support this statement. Revised Tables 7-1A, 7-1B, and 7-1D were also provided.

In RAI 13.3-12(C), the staff requested that the applicant explain why icy conditions were not considered in the estimates provided for schools and transit dependent people in Tables 8-5A/B, “School Evacuation Time Estimates-Good Weather/Rain,” and 8-6, “Summary of Transit Dependent Bus Routes for the Summer Nuclear Station.” In its response, the applicant stated that travel speed was reduced by 10 percent for rain scenarios and was reduced 20 percent for ice scenarios. A 10-minute increase in mobilization time was assumed for rain conditions to allow for slower travel speeds as the bus driver drives to the depot to pick up the bus and then drives from the depot to the school. A 20-minute increase was added to the base mobilization time for ice scenarios. The loading time was increased by five minutes for rain

scenarios to account for students who may be carrying umbrellas who have to close the umbrella before boarding the bus. It is assumed that this loading time is also adequate for ice scenarios. The ETE for ice assumes 10 additional minutes of route travel time and of passenger pickup time. The applicant has revised Table 8-5C, "School Evacuation Time Estimates – Ice" and Table 8-6C, "Transit Dependent Evacuation Time Estimates – Ice," to reflect these changes. The text in Section 8.4 was also revised to reflect these changes.

The methodology for the general population uses distribution functions. Figures describing the time distribution of evacuating vehicles follow the format on Figure 4, "Example of Additional Reporting Format for Time Estimates of Population Evacuation When Probability Distributions Are Used," of Appendix 4, to NUREG-0654/FEMA-REP-1. In RAI 13.3-13(A), the staff requested that the applicant explain why separate estimates were not made for transients and permanent residents. In its response, the applicant stated that all of the data requested in Table 2, "Example of Summary of Results of Evacuation Time Analysis," of NUREG-0654/FEMA-REP-1 are presented in various sections of the ETE Report to include Figure 3-4, "Transient Population by Sector," and Figure 3-5, Transient Vehicles by Sector."

Section 8, "Transit-Dependent and Special Facility Evacuation Time Estimates," discusses evacuation plans for schools, residents without vehicles, and special care facilities. These groups are expected to merge with general evacuation traffic following notification and mobilization. Separate estimates of population size and necessary transportation were made for schools, special facilities and the transit-dependent populations. Schools are given advanced notification, if possible, in order to determine transportation needs. The estimated students and their transportation needs, based on student to bus ratios, are provided in Table 8-2, "School Population Demand Estimates." Additional information on school transportation needs was requested in RAIs 13.3-8(D), (J), (K), and (M). In RAI 13.3-8(J)(1), the staff requested that the applicant explain why Table 6-4, "Vehicle Estimates by Scenario," indicates that 200 buses are needed to support evacuation of the schools and not the 95 buses identified in Table 8-2, "School Population Demand Estimates." In its response, the applicant stated that 100 buses are needed to evacuate all schoolchildren in the EPZ. The ETE Report indicates that one bus is equivalent to two passenger vehicles. Thus, Table 6-4 indicates that 200 vehicles (not buses) are modeled to represent 100 school buses in the simulation.

In RAI 13.3-8(J)(2), the staff requested the applicant clarify the column labeled, "Distance" in Table 8-2. In its response, the applicant stated that the column is the radial distance of the school from the existing reactor (Unit 1) at the VCSNS site. The column heading was revised to read "Distance from VCSNS (miles)."

In RAI 13.3-8(K), the staff requested the applicant explain why the number of children per bus is estimated differently for Mid-Carolina and Chapin Middle School. In its response, the applicant stated that the number of buses required for Chapin Middle School in Table 8-2 is incorrectly identified as 13. The value should be 18, resulting in a total of 100 buses for Table 8-2. This error was only in documentation. The correct number of buses was input to the evacuation model. Table 8-2 has been revised to reflect this correction.

In RAI 13.3-8(M), the staff requested the applicant clarify the number of buses necessary to evacuate students from McCrorey-Liston Elementary School. In its response, the applicant stated that Tab A to Appendix 9 to Annex Q of the Fairfield County Radiological Emergency Plan identifies an enrollment of 354 students. Internet searches indicate that the current enrollment for McCrorey-Liston Elementary is 250 students, which supports the data reported in the ETE Report.

In RAI 13.3-9(D), the staff requested the applicant discuss the use of school buses in Scenarios 1 and 2 as described in Tables 6-3, "Percent of Population Groups for Various Scenarios," and 6-4, "Vehicle Estimates by Scenario." In its response, the applicant stated that the buses shown for Scenarios 1 and 2 in Tables 6-3 and 6-4 are evacuating summer school students. It is assumed that summer school enrollment is approximately 10 percent of enrollment for the regular school year.

Transportation resources should be adequate to evacuate schools in one wave, but additional resources can be requested from nearby cities if necessary. Additional information regarding evacuation resources was requested in RAIs 13.3-7(F), (G), and (L). In RAI 13.3-8(F)(1), the staff requested that the applicant provide information regarding the process used to request additional resources. In its response, the applicant stated that the "Concept of Operations" section of Appendix L, "Transportation," to the Fairfield County Emergency Operations Plan indicates that transportation operations will be controlled from the County Emergency Operations Center. The Transportation Service Coordinator will coordinate all transportation requirements. State and Federal support will be committed, as available, on a mission-type basis on request to the State. Requests for use of additional transportation resources will be made through the County EOC.

In RAI 13.3-8(F)(2), the staff requested that the applicant explain how the implementation of the resource request process could affect evacuation times. In its response, the applicant stated that bus mobilization time is estimated to be 90 minutes, but would most likely exceed 90 minutes if additional resources had to be brought in from other cities. However, this should not be necessary.

In RAI 13.3-8(G)(1), the staff requested that the applicant clarify whether a time difference associated with other inclement conditions, such as ice, has been considered in the estimate of travel time back to the EPZ. In its response, the applicant stated that Table 8-6C, "Transit Dependent Evacuation Time Estimates – Ice," was added to the ETE Report. Additional information is provided in response to RAI 13.3-12(C).

In RAI 13.3-8(G)(2), the staff requested that the applicant explain whether travel time includes transferring traffic control points. In its response, the applicant states that primary objectives of traffic control points are to facilitate and guide the flow of evacuating traffic as discussed in the response to RAI 13.3-4(B). It is especially critical that traffic control points facilitate the movements of transit resources (buses and ambulances), which are needed to evacuate the transit-dependent and special facility populations within the EPZ. Therefore, the inbound bus speed of 45 mph will be unaffected as buses traverse traffic control points. Appendix 9 to Annex Q of the Fairfield County Radiological Emergency Plan states the following:

> Once a bus driver has left the 10-mile EPZ, the bus will be permitted to re-enter the affected area only if driven by an adult driver. Adult bus drivers may re-enter the affected area on a voluntary basis, only if the bus has no student passengers. No buses will be permitted back into the EPZ unless multi-trips are necessary.

It is anticipated in the county plans that buses may have to re-enter the EPZ to evacuate others who need transportation assistance. The following statement was added to the end of Section 9 of the ETE Report:

> As discussed in Section 2.3, these TCPs are not expected to influence the ETE results. Access control points (ACP) are deployed near the periphery of the EPZ to divert "through" trips. The ETE calculations reflect the assumption that all "external-external" trips are interdicted after 90 minutes have elapsed after the advisory to evacuate (ATE). All transit trips and other responders entering the EPZ to support the evacuation are assumed to be unhindered by personnel manning TCPs. Study Assumptions 6 and 7 in Section 2.3 discuss ACP and TCP staffing schedules and operations.

In RAI 13.3-8(L), the staff requested that the applicant clarify that there are sufficient resources to evacuate the schools in a single wave. In its response, the applicant provided an estimate of bus resources needed to evacuate schools in the EPZ and total enrollment by county. Estimates indicate that there are more than adequate transportation resources to evacuate the schools within the EPZ. The applicant submitted a revised Table 8-2 that includes this information.

The estimated time to evacuate schools within the plume exposure pathway EPZ is provided in Table 8-5A, “School Evacuation Time Estimates-Good Weather,” and Table 8-5B, “School Evacuation Time Estimates-Adverse Weather.” Evacuation of other special facilities, Generation of Chapin Nursing Home, is given the same consideration as schools with the exception of increased loading time. Mobilization of drivers and students has been built into the total evacuation times. The estimated population and necessary transportation resources can be found in Table 8-4, “Special Facility Transit-Demand Estimate.”

Remaining transportation resources and those that become available following the evacuation of schools will be used to evacuate the portion of the population without vehicles. The study estimates 222 people needing transportation can be evacuated in 8 bus runs. These individuals will be picked up along routes proposed in Section 8.4, “Evacuation Time Estimates for Transit-Dependent People,” and depicted in Figure 8-2, “Proposed Transit Dependent Bus Routes.” Additional information regarding evacuation of transit dependent people was requested in RAIs 13.3-8(H) and (I). In RAI 13.3-8(H), the staff requested that the applicant explain how transit-dependent individuals are expected to get from their residences to the bus routes, and whether this time was factored into the ETE. In its response, the applicant stated that evacuees are assumed to walk to the nearest route and “flag” down a bus traversing the route. Based on route design, the walking distance should be less than one mile. The 2000 HCM recommends a walking speed of 4.0 ft/sec for a pedestrian, which means the walk should take 22 minutes. Transit-dependent persons will be able to complete their preparation activities and walk to the routes by the time the buses arrive. Subsequent buses on a route will arrive later to service those who take longer to mobilize. Thus, the time needed for transit-dependent people to walk to the bus routes has been considered in the calculation of the transit-dependent ETE.

In RAI 13.3-8(I)(1) and (2), the staff requested that the applicant provide additional information on bus stop locations. In its response, the applicant stated that transit-dependent persons will walk to the nearest route and "flag" down a bus. There are no pre-established pickup points.

In RAI 13.3-8(I)(3), the staff requested that the applicant clarify whether stopping and dwell time were considered in the estimation of the average route travel time. In its response, the applicant stated that dwell time was considered pickup time, which was estimated to be about 15 minutes per bus run taking into consideration slowing of the bus and loading of passengers.

The estimated time to evacuate transit-dependent people within the plume exposure pathway EPZ is provided in Table 8-6A, “Transit Dependent Evacuation Time Estimates-Good Weather,” and Table 8-5B, “Transit Dependent Evacuation Time Estimates-Adverse Weather.”

A series of sensitivity tests are documented in Appendix I, “Evacuation Sensitivity Studies,” regarding the sensitivity of the results to trip generation time (directly related to time-dependent traffic loading) and to the amount of shadow evacuation. Additional information was requested in RAIs 13.3-13(C) and (D) to clarify assumptions regarding “shadow " population that is expected to evacuate and the numbers of vehicles that were proposed to be used. In RAI 13.3-13(C), the staff requested that the applicant explain what percentage of shadow residents are expected to evacuate. In its response, the applicant stated that the population within the shadow region is comprised of residents and employees. Employees in the shadow region are estimated to be in the same proportion relative to residents, as determined for the EPZ. This proportion is the ratio of 732 vehicles for employees to the total number of evacuating vehicles used by residents (4,439 + 2,123 = 6,562, listed in Columns 2 and 3 for Scenarios 1 and 2). This ratio is equal to 0.112. The total population of residents plus employees within the shadow region is 1.112 x the number of residents. Multiplying 1.112 by 0.3 (the percentage assumed to evacuate) yields 0.33 or the 33 percent figures shown in Column 6 of Table 6-3, “Percent of Population Groups for Various Scenarios,” for Scenarios 1 and 2. The same methodology applied to all scenarios in Column 6 of Table 6-3, and the estimates of evacuating vehicles shown in column 6 entitled “Shadow” of Table 6-4, “Vehicle Estimates by Scenario.”

In RAI 13.3-13(D), the staff requested that the applicant discuss the timing of the traffic loading onto the network for the shadow population identified in Table 6-4. In its response, the applicant stated that Table 6-4 indicates 7,678 shadow vehicles evacuating versus the 6,908 evacuating shadow vehicles shown in Table I-2, “Evacuation Time Estimates for Shadow Sensitivity Study.” Table I-2 only shows the shadow resident population and shadow resident vehicles evacuating. Based on the information provided in response to RAI 13.3-13(D), the applicant has revised Table I-2 to reflect the correct number of evacuating vehicles. The text on page I-2 will also be revised to reflect this correction. The following sentence was added to the end of the first paragraph:

> The case considered was Scenario 1, Region 3; a summer, midweek, midday, good weather evacuation for the entire EPZ.

The following two sentences were added to the end of the second paragraph followed by an updated formula used to calculate evacuating vehicles:

> As discussed in the "Shadow" footnote to Table 6-3, the shadow evacuation demand assumes a 30% relocation of shadow residents along with a proportional percentage of shadow employees. The percentage of shadow employees is computed using the scenario-specific ratio of EPZ employees to residents. Thus, for Scenario 1, with reference to Table 6-4:
>
> $$23{,}026 \times \left(1 + \frac{732}{4{,}439 + 2.123}\right) \times 30\% = 7{,}678 \text{ vehicles}$$

Technical Evaluation: [Section IV of Appendix 4] A total of 252 evacuation time estimates are computed for the evacuation of the general public. Each evacuation time estimate quantifies the aggregate evacuation time estimated for the population within one of the

21 Evacuation Regions to completely evacuate from that Region, under the circumstances defined for one of twelve Evacuation Scenarios (21 x 12 = 252). Separate evacuation time estimates are calculated for transit-dependent evacuees, including school children. An acceptable variant of the NUREG-0654/FEMA–REP-1, format is used for the presentation of the evacuation times in Appendix J.

Distribution functions for notification of the various categories of evacuees were developed. The distribution functions for the action stages after notification predict what fraction of the population will complete a particular action within a given span of time. There are separate distributions for auto-owning households, school population, and transit-dependent populations. These times are combined to form the trip generation distributions. There are separate distributions for auto-owning households, school population, and transit-dependent populations.

On-road travel and delay times are calculated. An estimate of the time required to evacuate a particular segment of the non-auto-owning population dependent on public transportation is developed, in a manner similar to that used for the auto-owning population.

The staff finds the additional information submitted in response to RAIs 13.3-8(F)(1) and (2), 13.3-8(H), 13.3-8(I)(1), (2), and (3), 13.3-8(J)(1), 13.3-8(M), 13.3-9(D), 13.3-13(A), (B), and (C), and 13.3-14(B) to be acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1.

In response to RAI 13.3-7(D), the applicant revised Figure 5-1 to include those households with employees who work during the evening or on weekends. The final paragraph on page 5-3 was revised to reflect this change. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-7(D) that clarified the textual information concerning transients to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-7(D).

In response to RAI 13.3-14(A), the applicant revised the discussion of Distribution 1 on page 5-4 to indicate that the distribution of notified persons within 30 minutes of an accident is assumed based on siren coverage. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-14(A) that clarified the textual information to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-14(A).

In response to RAIs 13.3-14(C) and 13.3-14(D), the applicant revised Figures 5-2, 5-3 and Distribution 4 on page 5-8 to reflect the truncation procedure discussed in response to RAI 13.3-9(C). The staff finds the additional information and textual revisions submitted in response to RAIs 13.3-14(C) and 13.3-14(D) that clarified the textual information to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAIs 13.3-14(C) and 13.3-14(D).

In response to RAIs 13.3-12(A) and (B), the applicant revised the ETE to include a new Scenario 11. Scenarios will be renumbered accordingly. The applicant has also revised the table on page 2-2, Table 6-2, Tables 7-1 A through D, and the table on page 2-5 to reflect this change. All references to “12 scenarios” will also be changed to “13 scenarios.” The staff finds

the additional information and textual revisions submitted in response to RAIs 13.3-12(A) and (B) that clarified the textual information to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAIs 13.3-12(A) and (B).

In response to RAI 13.3-8(J)(2), the applicant revised column labeled, "Distance" in Table 8-2 to "Distance from VCSNS (miles)." The staff finds the additional information and textual revisions submitted in response to RAI 13.3-8(J)(2) that clarified the textual information to be acceptable because they clarify the information in the table, which conforms to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-8(J)(2).

In response to RAI 13.3-8(K), the applicant revised Table 8-2 to identify the correct number of buses required to evacuate Chapin Middle School. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-8(K) that clarified the textual information to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-8(K).

In response to RAI 13.3-8(G)(1), the applicant provided a new Table 8-6C, "Transit Dependent Evacuation Time Estimates – Ice." The staff finds the additional information and textual revisions submitted in response to RAI 13.3-8(G)(1) that clarified the textual information to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-8(G)(1).

In response to RAI 13.3-8(G)(2), the applicant provided additional information to the end of Section 9 to support the assumption that the evacuation is unhindered by personnel manning TCP. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-8(G)(2) that clarified the textual information to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-8(G)(2).

In response to RAI 13.3-8(L), the applicant provided a revised Table 8-2 that clarified that transportation resources are adequate. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-8(L) that clarified the textual information to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-8(L).

In RAI 13.3-9(C), the staff requested clarification regarding truncation of data. The response provides a detailed discussion and basis for truncating data developed from the telephone survey. The ETE Report currently does not include any discussion on truncating data. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-9(C) that clarified the textual information to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-9(C).

In RAI 13.3-13(D), the staff requested that the applicant explain the values used in the shadow population and discuss the timing of traffic loading onto the network for the shadow population identified in Table 6-4. The applicant provided a detailed response on the development and calculation of the shadow population vehicles that included a revision to page I-2 of the ETE report. The staff finds the additional information and textual revisions submitted in response to RAI 13.3-13(D) that clarified the textual information to be acceptable because they conform to the guidance in NUREG-0654/FEMA-REP-1. The staff confirmed that Revision 2 of the VCSNS Emergency Plan incorporated the information and textual changes provided in the response to RAI 13.3-13(D).

The staff finds the ETE Report adequately addresses the descriptions of the methods used to estimate the evacuation times. This is acceptable because it conforms to the guidance in Section IV of Appendix 4 to NUREG-0654/FEMA-REP-1.

13.3C.18.6 Other Requirements

Technical Information in the ETE Report: [Section V of Appendix 4] Section 11, "Surveillance of Evacuation Operations," addresses the surveillance of the evacuation by use of staff at traffic control points, ground and aerial surveillance and citizen reports via cellular telephones. Surveillance of the evacuation will be coordinated and executed by local authorities. Section 12, "Confirmation Time," states the necessity to confirm the evacuation process. This is a county level responsibility and will be addressed in local procedures suggests a possible alternative procedure to confirm that the evacuation process is effective in the sense that the public is complying with the ETE. The development of the ETE Report was coordinated with emergency planners from the State of South Carolina and Fairfield, Lexington, Newberry, and Richland County who are involved in emergency response for the site. County Emergency Plans discuss reports on the "Status of Evacuation," and "completion time of evacuation." The signed certification letters for each county indicate that the EPZ counties have reviewed the ETE Report and will consider its content in their respective emergency plans.

In RAI 13.3-16(B), the staff requested that the applicant provide information regarding mobilization times for people who will be conducting the evacuation confirmation. In its response, the applicant stated that Section 12, Estimated Number of Telephone Calls Required for Confirmation of Evacuation," of the ETE Report suggests the use of a telephone survey to confirm evacuation. As indicated on Table 12-1, "Estimated Number of Telephone Calls Required for Confirmation of Evacuation," the confirmation process should not begin until three hours after the ATE, to ensure that households have had enough time to mobilize. This three hour timeframe will enable telephone operators to arrive at their workplace, access the call list and prepare to make phone calls. Section 12 of the ETE Report provides a methodology for evacuation confirmation. The suggested approach can be reinforced by other methods but this is a state/local planning issue and outside the scope of the ETE. Section 13, Recommendations," provides a list of recommendations offered to the State and local authorities on how to increase the efficiency and effectiveness of the evacuation operation.

Technical Evaluation: [Section V of Appendix 4] The staff finds the additional information submitted in response to RAI 13.3-16(B) to be acceptable because it conforms to the guidance in NUREG-0654/FEMA-REP-1. In addition, the development of the ETE Report was coordinated with emergency planners from the state of South Carolina and Fairfield, Lexington, Newberry, and Richland County who are involved in emergency response for the site. The staff finds the ETE Report adequately addresses the description of the procedure to confirm that the

evacuation process is effective. This is acceptable because it conforms to the guidance in Section V of Appendix 4 to NUREG-0654/FEMA-REP-1.

13.3C.18.7 Conclusions

On the basis of its review of the analysis of the ETE Report as described above, the NRC staff concluded that the information provided in the ETE Report is consistent with those portions of Section 13.3 of NUREG-0800 related to the evacuation time estimate analysis and is consistent with the guidance in Appendix 4 to NUREG-0654/FEMA-REP-1. Therefore, the ETE Report is acceptable and meets the applicable requirements of 10 CFR Part 50, Appendix E, Section IV.

13.3C.19 Inspection, Test, Analysis, and Acceptance Criteria (EP ITAAC)

13.3C.19.1 Regulatory Basis

The staff considered the following regulatory requirement and guidance in the evaluation of the information in the COL application related to EP ITAAC:

10 CFR 52.80(a), requires that a COL application include the proposed inspections, tests, and analyses, including those applicable to EP, that the licensee shall perform, and the acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will be operated in conformity with the COL, the provisions of the Atomic Energy Act, and the Commission's rules and regulations.

Table 14.3.10-1, “Emergency Planning Generic Inspections, Tests, Analyses, and Acceptance Criteria,” of NUREG-0800.

13.3C.19.2 Technical Information in the Application

The applicant addresses EP ITAAC in Table 3.8-1, “Inspections, Tests, Analyses, and Acceptance Criteria,” of Part 10 to the VCSNS COL application. The VCSNS COL application also incorporates by reference Tier 1 Table 3.1-1, “Inspections, Tests, Analyses, and Acceptance Criteria,” from the AP1000 DCD. The results of the NRC staff’s evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements. As noted in Section 13.3.4 of this SER, the staff will include the following license condition for VCSNS Units 2 and 3:

The licensee shall perform and satisfy the ITAAC defined in SER Table 13.3-1, “Emergency Plan ITAAC.”

SER Table 13.3-1 consists of the EP ITAAC identified in Table 3.8-1 of Appendix B to Part 10 of the VCSNS COL application, as modified by the applicant's letters dated May 18, August 24, and November 16, 2010, and June 28, 2011.

In its review of Table 3.8-1 of Appendix B to Part 10 of the application, the NRC staff used as review guidance the generic EP ITAAC in Table 14.3.10-1 to Section 14.3.10 of NUREG-0800. Table 14.3.10-1 identifies a generic set of acceptable emergency planning EP ITAAC. Since these EP ITAAC were established on a generic basis; they are not associated with any particular site or design. As such, several of the generic EP ITAAC requires the COL applicant

to provide more specific acceptance criteria that reflect the plant-specific design and site-specific emergency response plans and facilities.

Based on this comparison the staff requested the applicant, in RAI 13.3-30(B)[18], to address the following questions pertaining to the full-participation exercise.

1. RG 1.206, Appendix B, Table C.II.1-B1, Acceptance Criterion 14.1.2 includes the statement that "[t]he COL applicant will identify responsibilities and associated acceptance criteria." The applicant was asked to explain why Table 3.8-1 in the COL application, Acceptance Criteria 8.1.2 did not identify any responsibilities and associated acceptance criteria, in relation to onsite emergency response personnel successfully performing their assigned responsibilities. In its May 8, 2009, response, the applicant stated that the acceptance criteria for exercise demonstration will be provided in the procedures submitted in accordance with ITAAC Section 9.0 180 days prior to fuel load. The development of these procedures will address the new ERFs (TSC and EOF) as well as integration of the additional operating unit(s), and the expansion of the emergency response organization will determine the acceptance criteria for the performance of the emergency response personnel performing their assigned responsibilities.

2. RG 1.206, Appendix B, Table C.II.1-B1, Acceptance Criterion 14.1.1 includes the bracketed statement that "[t]he COL applicant will identify exercise objectives and associated acceptance criteria." Table 3.8-1, Acceptance Criterion 8.1.1 states that exercise objectives, including acceptance criteria, address each of the 8 listed EP program elements. However, Table 3.8-1 does not identify (in the acceptance criteria) what the exercise objectives and associated acceptance criteria are (as called for in Table C.II.1-B1). In its May 8, 2009, response, the applicant stated that the acceptance criteria for the demonstration of each exercise objective will be provided in the procedures submitted in accordance with ITAAC Section 9.0 180 days prior to fuel load. The development of these procedures will address the new ERFs (TSC and EOF) as well as the integration of the additional operating unit(s), and the expansion of the ERO will determine the acceptance criteria for the performance of the emergency response personnel performing their assigned responsibilities. In RAI 13.3-45, the staff requested the ITAAC table be revised for exercise criteria 8.1.1 to include the appropriate acceptance criteria for each of the 12 exercise objectives. In its May 18, 2010, response, the applicant provided further details associated with the acceptance criteria for exercise objectives in the ITAAC table that are consistent with NUREG-0800 EP ITAAC guidance.

In a letter dated August 24, 2010, regarding EP ITAAC 8.1.3, the applicant proposed that if offsite exercise deficiencies were not corrected prior to the 10 CFR 52.103(g) finding, then a license condition that requires offsite full participation exercise deficiencies to be corrected prior to operation above 5 percent of rated power will be requested. The staff finds that a reference to a license condition in EP ITAAC 8.1.3 is unnecessary because this license condition is now in 10 CFR 50.54(gg). However, the staff finds the applicant's request to modify EP ITAAC 8.1.3 to allow operation up to 5 percent power with uncorrected offsite exercise deficiencies acceptable because it is consistent with 10 CFR 50.54(gg). The staff is tracking, as **Confirmatory Item 13.3-8**, updating Part 10 of the application to reflect this information.

[18] This RAI referred to Table C.II.1-B11 in Appendix B of RG 1.206, which corresponds to Table 14.3.10-1 in Section 14.2.10 of NUREG-0800.

Correction and Resolution of Confirmatory Item 13.3-8

To resolve Confirmatory Item 13.3-8, the applicant committed to revise EP ITAAC 8.1.3 in Part 10 of the COL application to include a reference to 10 CFR 50.54(gg). The staff verified that Part 10 of the COL application included this revision to EP ITAAC 8.1.3. However, the staff has reconsidered the content of EP ITAAC 8.1.3 and notes the following issue associated with this ITAAC:

- Initially in the November 19, 2010, ASE, Section 13.3C.19.2 indicated that a reference to a license condition in EP ITAAC 8.1.3 was not required and that a reference to 10 CFR 50.54(gg) was necessary. However, since the requirements of 10 CFR 50.54(gg) are a license condition (i.e., the title of 10 CFR 50.54 is "Conditions of licenses"), the staff has determined that referring to a license condition is appropriate and that referring to 10 CFR 50.54(gg) in EP ITAAC 8.1.3 is redundant and unnecessary.

Based on the staff's reconsideration, differences now exist between the EP ITAAC 8.1.3 proposed by the applicant in Part 10 of its COL application and Table 13.3-1 of this FSER. The difference being that the applicant's proposed EP ITAAC 8.1.3 includes a reference to 10 CFR 50.54(gg), while Table 13.3-1 of this FSER does not.

Therefore, the staff has adopted the applicant's proposed EP ITAAC 8.1.3 in Table 13.3-1 of this FSER, which includes a reference to a license condition but does not include the applicant's proposed reference to 10 CFR 50.54(gg). Because EP ITAAC 8.1.3 will be based on FSER Table 13.3-1, further updating of Part 10 of the application is not necessary. As a result, Confirmatory Item 13.3-8 is now closed.

The applicant has proposed amending EP ITAAC 1.1, 5.1.5, and 5.2.4 to address specific plant parameters listed in the AP1000 DCD Table 7.5.1 and FSAR Table 7.5-201 that will be listed in each unit annex that will be retrievable in the Control Room, TSC, and EOF. This will be tracked as **Confirmatory Item 13.3-9**.

Resolution of Confirmatory Item 13.3-9

Confirmatory Item 13.3-9 is an applicant commitment to update COL application Part 10 to make changes to EP ITAAC 1.1, 5.1.5, and 5.2.4. The staff verified that the COL application Part 10 was appropriately updated. As a result, Confirmatory Item 13.3-9 is now closed. In a letter dated November 16, 2010, the applicant proposed an additional HFE ITAAC Acceptance Criteria 8.1.1.D.2 to demonstrate the capability of the TSC and EOF equipment and data displays to clearly identify the affected unit. This will be tracked as Confirmatory **Item 13.3-10**.

Resolution of Confirmatory Item 13.3-10

Confirmatory Item 13.3-10 is an applicant commitment to update COL application Part 10, to change HFE ITAAC 8.1.1.D.2. The staff verified that the COL application Part 10 was appropriately updated. As a result, Confirmatory Item 13.3-10 is now closed.

13.3C.19.3 Technical Evaluation

Because the RAI responses are consistent with NUREG-0800 EP ITAAC guidance, the staff finds the responses acceptable. The staff has incorporated the proposed markup to Table 3.8-1 into SER Table 13.3-1. The response to RAI 13.3-45 included a proposed markup to ITAAC Table 3.8-1. This item is identified as **Confirmatory Item 13.3-11**, pending NRC review and approval of the revised VCSNS COL application.

Resolution of Confirmatory Item 13.3-11

Confirmatory Item 13.3-11 is an applicant commitment to update COL application Part 10, to make changes to the ITAAC Table 3.8-1. The staff verified that the COL application Part 10 was appropriately updated. As a result, Confirmatory Item 13.3-11 is now closed.

The staff reviewed the EP ITAAC provided in Table 3.8-1 of Appendix B to Part 10 of the VCSNS COL application, as modified by the applicant's letters dated May 18, August 24 and November 16, 2010, and June 28, 2011, and confirmed that each of the ITAAC in NUREG-0800 Table 14.3.10-1 that provides an acceptable set of generic emergency planning ITAAC were included in Table 3.8-1. The staff further confirmed that the proposed ITAAC have been tailored to the specific reactor design and emergency planning program requirements of the VCSNS site. The complete set of EP ITAAC are provided in SER Table 13.3-1 that is based on Table 3.8-1 of Appendix B to Part 10 of the VCSNS COL application, as modified by the applicant's letters dated August 24 and November 16, 2010, and June 28, 2011, as discussed in the previous section of this SER. Therefore, the staff finds that the VCSNS COL application adequately provides EP ITAAC as required by 10 CFR 52.80(a).

13.3C.19.4 Conclusions

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to EP ITAAC, and there is no outstanding information expected to be addressed in the VCSNS COL application related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

As required by 10 CFR 52.80(a) the EP ITAAC in SER Table 13.3-1 include the proposed emergency planning inspections, tests, and analyses that the licensee shall perform, and the acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, the facility has been constructed and will operate in conformity with the license, the provisions of the Atomic Energy Act, and the NRC's rules and regulations.

13.4 Operational Programs (Related to RG 1.206, Section C.III.1, Chapter 13, C.I.13.4, "Operational Program Implementation")

13.4.1 Introduction

In SECY-05-0197, the NRC staff detailed its plan for reviewing operational programs in a COL application. The Commission approved the NRC staff's plan in the related Staff Requirements Memorandum (SRM), dated February 22, 2006. Although numerous programs support the

operation of a nuclear power plant, SECY-05-0197 focused on those programs that meet the following three criteria:

1. Required by regulation
2. Reviewed in a COL application
3. Inspected to verify program implementation as described in the FSAR

The programs that meet the above criteria are collectively referred to as "operational programs" and most are identified in SECY-05-0197.

13.4.2 Summary of Application

Section 13.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 13.4 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 13.4 and in Part 10 of the VCSNS COL application, "Proposed License Conditions and ITAAC)," the applicant provided the following:

AP1000 COL Information Item

- STD COL 13.4-1

The applicant provided additional information in STD COL 13.4-1 to address COL Information Item 13.4-1 and COL Action Item 13.4-1, identified in Appendix F of NUREG-1793 and its supplements. This item states that COL applicants referencing the AP1000 certified design will address each operational program.

License Conditions

- Part 10, License Condition 3, "Operational Program Implementation"
- Part 10, License Condition 6, "Operational Program Readiness"

Both license conditions are related to STD COL 13.4-1. License Condition 3 addresses implementation milestones for those operational programs whose implementation is not addressed in the regulations. License Condition 6 includes the timing of information related to operational programs to support NRC inspection activities.

13.4.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the regulatory basis for acceptance of the supplementary information presented in this application is identified in the individual chapters of this SER that address the evaluations of the specific operational programs, which are itemized in the next section, as clarified by the regulatory guidance in SECY-05-0197 and RG 1.206.

13.4.4 Technical Evaluation

The NRC staff reviewed Section 13.4 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the

complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to operational programs. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 13.4.4 of the VEGP SER:

> *Although the staff concluded that the evaluation performed for the standard content is directly applicable to the VEGP COL application, there were differences in the response provided by the VEGP applicant from that provided by the BLN applicant regarding the standard content material. These differences affect the two license conditions and the table listing the operational programs. These differences are evaluated by the staff below, following the standard content material.*
>
> *<u>AP1000 COL Information Item</u>*
>
> - *STD COL 13.4-1*
>
> *The applicant provided supplemental information by adding the following statement to Section 13.4 of the VEGP COL FSAR:*
>
> *Operational programs are specific programs that are required by regulations. Table 13.4-201 lists each operational program, the regulatory source for the*

program, the section of the FSAR in which the operational program is described, and the associated implementation milestone(s).

Each operational program is evaluated by the staff in the applicable SER chapters.

License Conditions

- *License Condition 3, "Operational Program Implementation"*
- *License Condition 6, "Operational Program Readiness"*

These two proposed license conditions are evaluated by the NRC staff as part of its evaluation of each of the operational programs in the applicable SER chapters.

The following portion of this technical evaluation section provides the staff's general evaluation of the operational programs and associated license conditions and is reproduced from Section 13.4.4 of the BLN SER:

The NRC staff's review of the acceptability of the supplemental information added by STD COL 13.4-1 and the proposed license conditions is based on four considerations. The first consideration is the acceptability of the individual operational programs, including the implementation of the different phases of these operational programs. The second consideration is whether the applicant correctly identified those operational programs whose implementation requirements are not addressed in the regulations, and, therefore, need to be included in License Condition 3. The third consideration is whether the applicant correctly specified in License Condition 6 the timing of information related to operational programs to support NRC inspection activities. The fourth consideration is whether the list of operational programs in BLN COL FSAR Table 13.4-201 is complete.

In regard to the first consideration, the SER sections referenced in the above table address the NRC staff's regulatory evaluation of the individual operational programs. For each of these operational programs, the staff has either concluded that the applicant has satisfied the applicable regulatory guidance (including the implementation requirements when specified in the regulations), or the staff's review is still ongoing. For those operational program reviews that are ongoing, the staff's final conclusions will be provided in the SER sections referenced in the above table at a later date.

In regard to the second consideration, the NRC staff verified that those operational programs, whose implementation requirements are not specified in the regulations, are captured in License Condition 3.

In regard to the third consideration, the NRC staff compared License Condition 6 to the recommended license condition in SECY-05-0197 related to the timing of information to support NRC inspection activities of operational programs. The staff finds that the applicant used language similar to the recommended license condition specified in SECY-05-0197 to develop License Condition 6. It should be noted that License Condition 6 addresses additional scheduler requirements

(Sections b. through d.) that are not related to the operational programs evaluated in this section of the SER, and, therefore, are not evaluated in this SER section.

In regard to the fourth consideration, the NRC staff compared the operational programs provided by the applicant in BLN COL FSAR Table 13.4-201 (included in the above table) to the operational programs specified in SECY-05-0197. The staff finds that the applicant has included all the operational programs specified in SECY-05-0197, including the two operational programs (Motor-Operated Valve Testing Program and the Safeguards Contingency Program) added by the NRC to the list of operational programs provided by the NEI in its letter dated August 31, 2005.

There are differences between BLN COL FSAR Table 13.4-201 and the table of operational programs in SECY-05-0197 with respect to implementation milestone information. The first difference is the SECY paper states that there are no required implementation milestones in the regulations for the Maintenance Rule Program and the Quality Assurance Program (Operation), while BLN COL FSAR Table 13.4-201 references regulations that require implementation milestones for these two programs. The staff has reviewed the regulation references provided by the applicant and concludes that they do provide appropriate requirements for implementation milestones. Further support for this conclusion is the regulatory guidance in Section C.I.13.4 of RG 1.206. The example table located in this section of the RG references the same implementation regulatory guidance for the Maintenance Rule Program and the Quality Assurance Program (Operation) as does BLN COL FSAR Table 13.4-201.

The second difference is that the SECY paper states that 10 CFR Part 50, Appendix J, specifies implementation requirements for the Containment Leakage Rate Testing Program, while BLN COL FSAR Table 13.4-201 states that the implementation milestones for this program will be controlled by a license condition. The staff has reviewed the implementation milestone proposed in License Condition 3 for the Containment Leakage Rate Testing Program, and finds that it is more stringent than the regulatory guidance in Appendix J. Therefore, the staff finds this difference to be acceptable.

The applicant added an operational program to BLN COL FSAR Table 13.4-201, the Initial Test Program, which is not in the list of operational programs specified in SECY-05-0197. The option of adding operational programs to this list is specifically allowed by SECY-05-0197. Further support for the acceptability of adding the Initial Test Program is that the example table located in Section C.I.13.4 of RG 1.206 also lists this operational program.

Therefore, the NRC staff concludes that the additional information (STD COL 13.4-1) provided by the applicant in BLN COL FSAR Section 13.4, in conjunction with the conditions specified in BLN COL FSAR, Part 10, License Conditions 3 and 6, complies with the applicable regulatory guidance provided in SECY-05-0197.

Evaluation of Site-specific Response to Standard Content

The staff notes that the VEGP applicant separated the fitness-for-duty (FFD) program from the overall security program and added a new operational program, Cyber Security, to the list of operational programs in FSAR Table 13.4-201. The implementation requirements for these additional operational programs comply with the considerations identified above in the standard content material, and are, therefore, acceptable. In addition, the VEGP applicant also made minor changes to operational program implementation details in License Condition 3 and also modified Sections a. through d. associated with License Condition 6. The changes to these two license conditions are evaluated by the staff in the applicable SER chapters and do not affect the evaluation of operational programs covered in this section of the SER. Therefore, the conclusions reached by the NRC staff related to STD COL 13.4-1 are directly applicable to the VEGP COL application.

The BLN SER text refers to an SER table listing operational programs. This table was not reproduced for the VEGP SER since it duplicates the information in VEGP COL FSAR Table 13.4-201.

13.4.5 Post Combined License Activities

The license conditions for each of the operational programs are discussed in the applicable SER chapters. Therefore, there are no post-COL activities related to this section.

13.4.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to operational programs, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable based on the regulatory guidance in SECY-05-0197, in conjunction with the applicable regulations specified in the individual sections of this SER that evaluated each of the operational programs discussed above. The staff based its conclusion on the following:

- STD COL 13.4-1, as related to operational programs, is acceptable because each of the operational programs in VCSNS COL FSAR Table 13.4-201 has been found acceptable by the NRC staff in other sections of this SER, as noted in Section 13.4.4 above. In addition, the guidance in SECY-05-0197 and RG 1.206 was used to verify that the applicant's list of operational programs is complete.

13.5 Plant Procedures

13.5.1 Introduction

Descriptions of the administrative and operating procedures that the applicant uses to ensure routine operating, off-normal, and emergency activities are conducted in a safe manner are

provided. The applicant, in its plant procedures, provided a brief description of the nature and content of the procedures and a schedule for the preparation of appropriate written administrative and operating procedures. The applicant delineated in the description of the procedures the functional position for procedural revision and approval prior to implementation. Inspection of procedures will occur as part of the construction inspection program.

13.5.2 Summary of Application

Section 13.5 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 13.5 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 13.5, the applicant provided the following:

AP1000 COL Information Item

- STD COL 13.5-1

The applicant provided additional information in STD COL 13.5-1 to resolve COL Information Item 13.5-1 (COL Action Item 13.5-1), which addresses plant procedures.

Supplemental Information

- VCS SUP 13.5-1 and VCS SUP 13.5-2

The applicant provided plant-specific supplemental information in VCS SUP 13.5-1 and VCS SUP 13.5-2 to resolve COL Information Item 13.5-1 (COL Action Item 13.5-1), which addresses plant procedures.

13.5.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for plant procedures are given in Sections 13.5.1.1 and 13.5.2.1 of NUREG-0800.

The applicable regulations and regulatory guidance are as follows:

- 10 CFR 50.34(a), “Preliminary safety analysis report”
- 10 CFR 50.34(b), “Final safety analysis report”
- RG 1.33

13.5.4 Technical Evaluation

The NRC staff reviewed Section 13.5 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff’s review confirmed that the information in the application and incorporated by reference addresses the required information relating to plant procedures. The results of the NRC staff’s evaluation of the

information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VEGPCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 13.5.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 13.5-1, addressing plant procedures*

The applicant provided the following additional information to resolve COL Information Item 13.5-1, which addresses the plant procedures of the COL applicant. COL Information Item 13.5-1 states:

> *Combined License applicants referencing the AP1000 certified design will address plant procedures including the following:*
>
> - *Normal operation*
> - *Abnormal operation*
> - *Emergency operation*
> - *Refueling and outage planning*
> - *Alarm response*
> - *Maintenance, inspection, test and surveillance*
> - *Administrative*
> - *Operation of post-72 hour equipment*

The commitment was also captured as COL Action Item 13.5-1 in Appendix F of the staff's FSER for the AP1000 DCD (NUREG-1793).

The applicant provided additional text in BLN COL FSAR Section 13.5 to describe the administrative, operating and maintenance procedures that the operating organizational staff uses to conduct routine operating, abnormal, and emergency activities in a safe manner.

In BLN COL FSAR Section 13.5, the applicant described the different classifications of procedures that the operators will use, including normal, abnormal, emergency, refueling and outage, and alarm response procedures. The staff finds this information acceptable because it meets the criteria in NUREG-0800, Chapter 13.5.2.1.

In BLN COL FSAR Section 13.5, the applicant stated that the format and content of procedures are controlled by the applicable AP1000 writer's guideline. The DCD, Section 13.5.1, describes a referenced document, APP-GW-GLR-040, "Plant Operations Maintenance and Surveillance Procedures," dated August 23, 2007, which includes the AP1000 writer's guidelines. The staff finds this acceptable because the applicant-provided procedure format and content are consistent with the guidance in NUREG-0800, Section 13.5.2.1.

In BLN COL FSAR Section 13.5.1, the applicant describes the nature and content of administrative procedures for both Category (A) - Controls, and Category (B) - Specific Procedures. The staff finds this acceptable because the listed procedures are consistent with the guidance in NUREG-0800, Section 13.5.1.1.

In BLN COL FSAR Section 13.5.2, the applicant stated that EP procedures are discussed in the Emergency Plan and that security procedures are discussed in the Security Plan. The evaluation of EP procedures may be found in Section 13.3 of this SER. The evaluation of security procedures is found in Section 13.6 of this SER.

In BLN COL FSAR Section 13.5.2, the applicant stated the Quality Assurance Program description (QAPD) provides a description of procedural requirements for maintenance, instrument calibration and testing, inspection, and material control. The evaluation of QAPD procedures is found in Section 17.5 of this SER.

In BLN COL FSAR, Section 13.5.2.1, the applicant stated that information related to EOPs is addressed in the DCD. The DCD, Section 13.5.1, describes the program for developing and implementing EOPs and the required content of EOPs procedures in the referenced document, APP-GW-GLR-040. In addition, this information clarifies the procedure development program (PDP) as described in the procedures generation package (PGP) for EOPs, provides a description of the EOP [emergency operating plan] *verification and validation (V&V) program, and describes the program for training operators on EOPs, including an explanation of how the recommendations of TMI Action Plan, Item I.C.1, will be met. The staff finds the program for developing and implementing EOPs acceptable because it meets the criteria in NUREG-0800, Section 13.5.2.1.*

Evaluation of Plant Procedure Issues Not Address in the Standard Content Evaluation

In VEGP COL FSAR Table 1.9-202, "Conformance with SRP Acceptance Criteria," the applicant identified two exceptions to the criteria of NUREG-0800, Section 13.5, which recommend[s] *providing a schedule for procedure development in the FSAR, and including a description of procedures to be used by operators in the FSAR. The staff notes that the BLN COL FSAR Table 1.9-202 includes these same two exceptions to the criteria of Section 13.5 of NUREG-0800. The guidance of NUREG-0800, Section 13.5.2.1, states that while the submittal should describe the different classifications of procedures that operators will use, it is not necessary that each applicant's procedures conform precisely. In addition, the procedures, regardless of title or classification, are to be available to accomplish the functions identified in RG 1.33. NUREG-0800 makes allowance for "general areas." The staff finds the two exceptions to the criteria of NUREG-0800, Section 13.5 to be acceptable because the applicant's procedure classification follows the guidance in NUREG-0800, Section 13.5.*

In RAI [request for additional information] *13.6-36, the staff requested the VEGP applicant address the requirements of 10 CFR 73.58, "Safety/security requirements for nuclear power plants." In its response dated May 14, 2010, the applicant stated that management controls and processes used to establish and maintain an effective interface between nuclear safety and physical security are addressed by administrative controls. The VEGP applicant committed to revise FSAR Section 13.5.1 to include the safety/security interface implementation process in the list of procedural instructions provided in plant administrative procedures. The NRC staff's review of this safety/security procedural issue, which includes tracking the incorporation of the relevant material into the VEGP COL application, is addressed in Section 13.6.4.1.17 of this SER.*

Supplemental Information

- VCS SUP 13.5-1 and VCS SUP 13.5-2

In VCSNS COL FSAR Section 13.5.1, the applicant provides plant-specific supplemental information describing the nature and content of administrative procedures for specific procedures. The staff finds this acceptable because the listed procedures are consistent with the guidance in NUREG-0800, Sections 13.5.1.1 and 13.5.2.1.

13.5.5 Post Combined License Activities

There are no post-COL activities related to this section.

13.5.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to plant procedures, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the

information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the recommendations of NUREG-0800, Sections 13.5.1.1 and 13.5.2.1. The staff based its conclusion on the following:

- STD COL 13.5-1, as related to plant procedures, is acceptable because it describes the procedures used by the applicant's operating organizational staff to conduct routine administrative, operating, abnormal, and emergency activities in a safe manner, in accordance with the regulatory guidance in NUREG-0800, Sections 13.5.1.1 and 13.5.2.1.

- VCS SUP 13.5-1 and VCS SUP 13.5-2, as related to plant-specific plant procedures, is acceptable because they describe procedures used by the applicant's operating organizational staff to conduct routine administrative, operating, abnormal, and emergency activities in a safe manner, in accordance with the regulatory guidance in NUREG-0800, Sections 13.5.1.1 and 13.5.2.1.

- In VCSNS COL FSAR Table 1.9-202, the applicant identified two exceptions to the criteria of NUREG-0800, Section 13.5, related to providing FSAR descriptions of, and a development schedule for, procedures to be used by operators. The guidance of NUREG-0800, Section 13.5.2.1, makes allowances for "general areas," stating that while the FSAR submittal should describe the different classifications of procedures used by operators, it is not expected that each applicant's procedures conform precisely. The staff finds the two exceptions to be acceptable because the applicant's procedure classification follows the guidance in NUREG-0800, Section 13.5.

13.6 Physical Security

13.6.1 Introduction

The COL application for the VCSNS Units 2 and 3 describes the COL applicant's physical protection program, which is intended to meet NRC regulations for protection against the design basis threat (DBT) of radiological sabotage as stated in 10 CFR 73.1 and provide a high assurance that activities involving special nuclear material are not inimical to the common defense and security and do not constitute an unreasonable risk to the public health and safety.

The physical protection program includes the design of a physical protection system that ensures the capabilities to detect, assess, interdict, and neutralize threats of radiological sabotage are maintained at all times. The applicant incorporates by reference the standard AP1000 design that includes design of physical protection systems within the design of the vital island and vital structures, as described in the Westinghouse Electric Company (Westinghouse) design certification document for the AP1000 standard design Tier 1 and Tier 2 information, including Technical Report (TR)-49, "AP1000 Enhancement Report, TR-94, "AP1000 Safeguards Assessment Report," and TR-96, "Interim Compensatory Measures Report." Part 8 of the COL application consists of the VCSNS Units 2 and 3 Physical Security Plan (PSP), Training and Qualification Plan (T&QP), and Safeguards Contingency Plan (SCP). Section 13.6 of the VCSNS COL FSAR describes the physical protection program and the physical protection system that are not addressed within the scope of the standard AP1000 design for meeting NRC performance and prescriptive requirements for physical protection stated in

10 CFR Part 73, “Physical Protection of Plants and Material.” Those persons with the correct access authorization and need-to-know may view the safeguards information version of the VCSNS COL application Section 13.6 SER, which is located in the NRC’s Secure Local Area Network, document number ES100015156.

13.6.2 Summary of Application

Section 13.6 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 13.6 of the AP1000 DCD, Revision 19.

Part 8 – Safeguards/Security Plans

In a letter dated March 27, 2008, SCE&G submitted a PSP to the NRC as part of the COL application for proposed VCSNS Units 2 and 3. In a letter dated April 2, 2009, SCE&G submitted Revision 1 to the PSP. In a letter dated August 14, 2010, SCE&G submitted Revision 2 to its PSP.

In addition, in VCSNS COL FSAR Section 13.6, the applicant provided the following:

AP1000 COL Information Items

- STD COL 13.6-1

The applicant provided additional information in STD COL 13.6-1 to address COL Information Item 13.6-1, which provides information related to the security plan. The security plan consists of three parts, the PSP, T&QP, and SCP.

- STD COL 13.6-5

The applicant provided additional information in STD COL 13.6-5 to address COL Information Item 13.6-5, which provides information related to the cyber security program. This COL item is evaluated in Section 13.8 of this SER.

License Conditions

- Part 10, License Condition 3, Items C.5, D.3, and G.9

The applicant proposed a license condition in Part 10 of the VCSNS COL application, which provides the milestones for implementing applicable portions of the Security Program.

- Part 10, License Condition 5

The applicant proposed a license condition in Part 10 of the VCSNS COL application, which proposed the maintenance of the PSP, T&QP, and the SCP when nuclear fuel is onsite, and continuing until all nuclear fuel is permanently removed from the site.

- Part 10, License Condition 6

The applicant proposed a license condition to provide a schedule to support the NRC’s inspection of operational programs including the PSP, T&QP, and the SCP.

13.6.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

The applicable regulatory requirements for physical protection are as follows:

- The provisions of 10 CFR 52.79(a)(35)(i) and (ii) require that information submitted for a (COL) describe how the applicant will meet the requirements of 10 CFR Part 73, "Physical Protection of Plants and Material"; and provide a description of the implementation of the PSP. The provisions of 10 CFR 52.79(a)(36)(i) through (v) require that the application include an SCP in accordance with the criteria set forth in Appendix C, "Nuclear Power Plant Safeguards Contingency Plans," to 10 CFR Part 73, and a T&QP in accordance with Appendix B of 10 CFR Part 73, that the applicant provide a description of the implementation of the SCP and the T&QP and that the applicant protect the PSP, SCP and T&QP in accordance with the requirements of 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

- The provisions of 10 CFR Part 73 include performance-based and prescriptive regulatory requirements that, when adequately met and implemented, provide high assurance that activities involving special nuclear material are not inimical to the common defense and security and do not constitute an unreasonable risk to the public health and safety. A COL applicant must describe how it will meet the regulatory requirements of 10 CFR Part 73 that are applicable to nuclear power plants.

A COL applicant is required to identify and describe design features, analytical techniques, and technical bases for its design and how it will meet provisions of physical protection system requirements in the NRC regulations, using applicable RGs and NUREG-0800. However, the NRC RGs and NUREG-0800 are not regulatory requirements and are not a substitute for compliance with established regulations. Where alternative methods are chosen or differences exist, the COL applicant is required to describe how the proposed alternatives to guidance or acceptance criteria provide acceptable methods of compliance with the NRC regulations.

NUREG-0800 Section 13.6.1, Revision 1, June 15, 2010 was used by the NRC staff to complete the physical security COL review.

Regulatory guidance documents, TRs, and accepted industry codes and standards that an applicant may apply to meet regulatory requirements include, but are not limited to the following:

- RG 5.7, "Entry/Exit Control for Protected Areas, Vital Areas, and Material Access Areas," Revision 1

- RG 5.12, "General Use of Locks in the Protection and Control of Facilities and Special Nuclear Materials"

- RG 5.44, “Perimeter Intrusion Alarm Systems,” Revision 3
- RG 5.62, “Reporting of Safeguards Events,” Revision 1
- RG 5.65, “Vital Area Access Controls, Protection of Physical Protection System Equipment and Key and Lock Controls”
- RG 5.66, “Access Authorization Program for Nuclear Power Plants”
- RG 5.68, “Protection Against Malevolent Use of Vehicles at Nuclear Power Plants”
- RG 5.74, “Managing the Safety/Security Interface”
- RG 5.75, “Training and Qualification of Security Personnel at Nuclear Power Reactor Facilities”
- NRC letter dated April 9, 2009, NRC Staff Review of NEI 03-12, “Template for Security Plan, Training and Qualification, Safeguards Contingency Plan, [and Independent Spent Fuel Storage Installation Security Program]” (Revision 6)
- SECY-05-0197

The following documents include security-related or safeguards information and are not publicly available:

- RG 5.69, “Guidance for the Application of Radiological Sabotage Design Basis Threat in the Design, Development, and Implementation of a Physical Security Protection Program that Meets 10 CFR 73.55 Requirements”
- RG 5.76, “Physical Protection Programs at Nuclear Power Reactors”
- NEI 03-12, Revision 6, “Template for the Security Plan, Training and Qualification Plan, Safeguards Contingency Plan, and Independent Spent Fuel Installation Security Program”
- NUREG/CR-6190, “Update of NUREG/CR-6190 Material to Reflect Postulated Threat Requirements”

13.6.4 Technical Evaluation

The NRC staff reviewed Section 13.6 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff’s review confirmed that the information in the application and incorporated by reference addresses the required information relating to physical security. The results of the NRC staff’s evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in

evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff compared the VEGP PSP, T&QP, and SCP to the corresponding VCSNS programs. The staff has determined that these plans are sufficiently similar to warrant standard content treatment.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application, with the exception discussed in the following paragraph. This standard content material is identified in this SER by use of italicized, double-indented formatting. One clarification to the standard content material presented below is that the NRC staff's detailed evaluation of the physical protection program, which is site-specific, is provided in the safeguards information version of the VCSNS COL application Section 13.6 SER, which is located in the NRC's Secure Local Area Network, document number ES1000015156.

There were site-specific RAIs issued to the VCSNS applicant that resulted in site-specific evaluations for several of the Security Plan review areas. There were also site-specific RAIs issued to the VEGP applicant that were not applicable to the VCSNS application. In addition, there are several Security Plan review areas with site-specific characteristics requiring a specific review by the staff. For these cases, the staff provides the VCSNS evaluation in the same location as provided in the VEGP SER, but without the use of italicized, double-indented formatting.

The following portion of this technical evaluation section is reproduced from Section 13.6.4 of the VEGP SER:

<u>AP1000 COL Information Item</u>

- *STD COL 13.6-1*

The NRC staff reviewed STD COL 13.6-1 related to COL Information Item 13.6-1, which identified the need for a COL applicant to address the security plan. STD COL 13.6-1 supplemented Section 13.6 of the VEGP COL FSAR by stating the following text is to be added after Section 13.6 of the VEGP ESP SSAR:

> *The Security Plan consists of the Physical Security Plan, the Training and Qualification Plan, and the Safeguards Contingency*

Plan. The Security Plan is submitted to the Nuclear Regulatory Commission as a separate licensing document in order to fulfill the requirements of 10 CFR 52.79(a)(35) and 52.79(a)(36). The Security Plan meets the requirements contained in 10 CFR Part 73 and will be maintained in accordance with the requirements of 10 CFR 52.98. The Plan is categorized as Security Safeguards Information and is withheld from public disclosure pursuant to 10 CFR 73.21.

Section 13.6 of the VEGP COL FSAR also refers to FSAR Table 13.4-201, "Operational Programs Required by NRC Regulations," as providing the milestones for implementing the security program and cyber security program.

The NRC staff's evaluation of the PSP is documented in Section 13.6.4.1 of this SER. The NRC staff's evaluation of the T&QP is documented in Section 13.6.4.2 of this SER. The NRC staff's evaluation of the SCP is documented in Section 13.6.4.3 of this SER. The NRC staff's evaluation of the safety/security interface is documented in Section 13.6.4.1.17 of this SER. Section 13.6.5 of this SER includes the post-combined license activities. Section 13.6.6 of this SER includes the NRC staff's overall conclusions regarding each of the plan submissions.

The NRC staff's evaluation of the physical protection program is provided in detail in the safeguards information version of the VEGP COL application Section 13.6 SER, which is located in the NRC's Secure Local Area Network, document number ES1000015157. Due to security restraints, the NRC staff's evaluation of the physical protection program presented in this publicly-available SER does not include the same level of detail as the safeguards information version. Those persons with the correct access authorization and need-to-know may view the safeguards information version of the VEGP COL application Section 13.6 SER.

<u>License Conditions</u>

- *Part 10, License Condition 3, Items C.5, D.3, and G.9*

The applicant proposed a license condition in Part 10 of the VEGP COL application, which provides the milestones for implementing applicable portions of the Security Program. Specifically, the applicant proposed the following:

> *C. Receipt of Materials – The licensee shall implement each operational program identified below prior to initial receipt of byproduct, source, or special nuclear materials onsite (excluding Exempt Quantities as described in 10 CFR 30.18).*
>
> *C.5 – Security Program (applicable portions)*
>
> *D. Fuel Receipt – The licensee shall implement each operational program identified below prior to initial receipt of fuel onsite.*
>
> *D.3 – Security Program (applicable portions)*

G. Fuel Loading – The licensee shall implement each operational program identified below prior to initial fuel load.
G.9 – Physical Security

- *Part 10, License Condition 5*

The applicant proposed a license condition in Part 10 of the VEGP COL application, which proposed the maintenance of the PSP, T&QP, and the SCP when nuclear fuel is onsite, and continuing until all nuclear fuel is permanently removed from the site. Specifically, the applicant proposed the following:

> *The licensee shall maintain in effect the provisions of the physical security plan, security personnel training and qualification plan, and safeguards contingency plan, and all amendments made pursuant to the authority of 10 CFR 50.90, 50.54(p), 52.97, and Section VIII of Appendix D to Part 52 when nuclear fuel is onsite, and continuing until all nuclear fuel is permanently removed from the site.*

In a letter dated October 22, 2010, the applicant proposed to revise the [security plan] milestone included in VEGP COL FSAR Table 13.4-201 to implement the [security plan] prior to receipt of fuel onsite (protected area.) The NRC staff finds the implementation milestone for the security ~~program~~[plan] (~~security~~ prior to receipt of fuel onsite (protected area)) appropriate and in accordance with the requirement in 10 CFR 73.55, "Requirements for physical protection of licensed activities in nuclear power reactors against radiological sabotage." Therefore the staff finds that the proposed License Condition 3, Items C.5, D.3, and G.9 and License Condition 5 are not necessary. The incorporation of proposed changes to the VEGP COL FSAR is tracked as ***Confirmatory Item 13.6-1.***

Resolution of Standard Content Confirmatory Item 13.6-1

Confirmatory Item 13.6-1 is an applicant commitment to revise its FSAR Table 13.4-201 regarding the implementation milestones for the security program. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 13.6-1 is now closed.

- *Part 10, License Condition 6*

The applicant proposed a license condition to provide a schedule to support the NRC's inspection of operational programs including the PSP, T&QP, and the SCP. Specifically, the applicant proposed the following:

> *The licensee shall submit to the appropriate Director of the NRC, a schedule, no later than 12 months after issuance of the COL, that supports planning for and conduct of NRC inspections of operational programs listed in the operational program FSAR Table 13.4-201. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until either the operational programs in the FSAR table*

have been fully implemented or the plant has been placed in commercial service, whichever comes first.

The staff reviewed the above proposed license condition against the recommendations in SECY-05-0197 as endorsed by the related SRM dated February 22, 2006. The staff concludes these proposed license conditions conform to the guidance in SECY-05-0197 and is, therefore, acceptable.

13.6.4.1 Physical Security Plan

The applicant submitted Part 8 of the COL application for the VEGP PSP, T&QP and SCP, to meet the requirements of 10 CFR 52.79(a)(35) and (36). Part 2, FSAR, Chapter 13, Section 13.6 references the VEGP PSP, T&QP, and SCP in describing the licensing basis for establishing a physical protection program, design of a physical protection system, and security organization, which will have, as its objective, to provide high assurance that activities involving special nuclear material are not inimical to the common defense and security and do not constitute an unreasonable risk to the public health and safety. The VEGP submitted PSP makes references to 10 CFR 50.34(c)(2) and (d)(2). The correct references should be 10 CFR 52.79(a)(35) and (36). It is noted that this is a template error, and both references require that the same criteria be met.

Security plans must describe how the applicant will implement Commission requirements and those site-specific conditions that affect implementation as required by 10 CFR 73.55(c)(1)(i).

The requirements are provided in 10 CFR 73.55(c), and (d) to establish, maintain, and implement a PSP to meet the requirements of 10 CFR 73.55, and 10 CFR Part 73, Appendices B and C. The applicant must show establishment and maintenance of a security organization, the use of security equipment and technology, the training and qualification of security personnel, the implementation of predetermined response plans and strategies, and the protection of digital computer and communication systems and networks. The applicant must have a management system for development, implementation, revision, and oversight of security implementing procedures. The approval process for implementing security procedures will be documented.

The NRC staff has reviewed the applicant's description in PSP Section 1 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(c) and (d), and is, therefore, acceptable.

13.6.4.1.1 Introduction and Physical Facility Layout

The provisions of 10 CFR 52.79(a)(35):

(i) A PSP, describing how the applicant will meet the requirements of 10 CFR Part 73 (and 10 CFR Part 11, "Criteria and procedures for determining eligibility for access to or

control over special nuclear material," if applicable, including the identification and description of jobs as required by 10 CFR 11.11(a) of this chapter, at the proposed facility). The plan must list tests, inspections, audits, and other means to be used to demonstrate compliance with the requirements of 10 CFR Parts 11 and 73, if applicable;

(ii) A description of the implementation of the PSP;

The provisions of 10 CFR 52.79(a)(36) require:

(i) An SCP in accordance with the criteria set forth in Appendix C to 10 CFR Part 73. The safeguards contingency plan shall include plans for dealing with threats, thefts, and radiological sabotage, as defined in 10 CFR Part 73 of this chapter, relating to the special nuclear material and nuclear facilities licensed under this chapter and in the applicant's possession and control. Each application for this type of license shall include the information in the applicant's SCP. (Implementing procedures required for this plan need not be submitted for approval);

(ii) A T&QP in accordance with the criteria set forth in Appendix B to 10 CFR Part 73;

(iii) A cyber security plan (CSP) in accordance with the criteria set forth in 10 CFR 73.54 of this chapter;

(iv) A description of the implementation of the SCP, T&QP, and CSP; and

(v) Each applicant who prepares a PSP, an SCP, a T&QP, or a CSP, shall protect the plans and other related Safeguards Information against unauthorized disclosure in accordance with the requirements of 10 CFR 73.21 of this chapter.

The provisions of 10 CFR 52.79(a)(44) require a description of the FFD program required by 10 CFR Part 26 and its implementation.

Requirements are established in 10 CFR 73.55(c)(2) to ensure protection of safeguards information (SGI) against unauthorized disclosure in accordance with 10 CFR 73.21. The applicant's submittal acknowledges that the PSP, the TQ&P and the SCP discuss specific features of the physical security system or response procedures and are SGI.

Section 1 of the PSP describes the applicant's commitment to satisfying 10 CFR 50.34(c), 10 CFR 50.34(d) and 10 CFR Part 73 by submitting a PSP, and to controlling the PSP and appendices as Safeguards Information according to 10 CFR 73.21.

The provisions of 10 CFR Part 73, Appendix C, Section II.B.3.b, requires a description of the physical layout of the site.

Section 1.1 of the PSP provides descriptions of location, site layout, and facility configuration. The PSP describes the physical structures and their locations on the site, description of the protected area, and a description of the site in relation to nearby town, roads, and other environmental features important to the coordination of response operations. The plant layout includes identification of main and alternate entry routes for law enforcement assistance forces and the location of control points for marshaling and coordinating response activities.

In addition, Section 1.2 of the VCSNS COL application provides general plant descriptions that include details of the 10 to 50 mile radius of the geographical area of the VCSNS Units 2 and 3 site, a site area map, and general plant and site descriptions. VCSNS COL FSAR, Chapter 1, references the AP1000 DCD for the principal design and operating characteristics for the design and construction of the VCSNS Units 2 and 3. Part 1, General Information, of the VCSNS COL application describes the name of the applicant and principal business locations.

The NRC staff has reviewed the facility physical layout provided in Section 1.1 of the PSP and as supplemented by VCSNS COL FSAR. The NRC staff determined that the applicant included site-specific conditions that affect the applicant's capability to satisfy the requirements of a comprehensive PSP. The applicant has adequately described the physical structures and their locations onsite and the site in relation to nearby towns, roads, and other environmental features important to the effective coordination of response operations. The applicant described the main and alternate entry routes for law-enforcement assistance forces and the location of control points for marshaling and coordinating response activities in the site-specific law enforcement response plan. The NRC staff concludes that the applicant's security plans have met the requirements for content of a PSP as stated above. Therefore, the NRC staff finds the "Facility Layout" described in the PSP and the VCSNS COL FSAR is adequate.

The following portion of this technical evaluation section is reproduced from Section 13.6.4.1 of the VEGP SER:

> *13.6.4.1.2 Performance Objectives*
>
> *The provisions of 10 CFR 73.55(b)(1) requires, in part, that the applicant shall establish and maintain a physical protection program with an objective to provide high assurance that activities involving special nuclear material are not inimical to the common defense and security and do not constitute an unreasonable risk to the public health and safety. The provisions of 10 CFR 73.55(b)(2) establish, in part, the requirement to protect a nuclear power reactor against the DBT of radiological sabotage as described in 10 CFR 73.1*,[. The provisions of] *10 CFR 73.55(b)(3)(i), and 10 CFR 73.55(b)(3)(ii) require the applicant to establish a physical protection program designed to ensure the capabilities to detect, assess, interdict, and neutralize threats up to and including the DBT of radiological sabotage as stated in 10 CFR 73.1, are maintained at all times, provide defense-in-depth, supporting processes, and implementing procedures, which ensure the effectiveness of the physical protection program.*
>
> *Section 2 of the PSP outlines the requirements for the establishment and maintenance of an onsite physical protection system, security organization, and integrated response capability. As part of the objective, the security program design shall incorporate supporting processes such that no single event can disable the security response capability because of defense-in-depth principles including diversity and redundancy. The physical protection systems and programs described herein are designed to protect against the DBT of radiological sabotage in accordance with the requirements of 10 CFR 73.55(a) through (r) or equivalent measures that meet the same high assurance objectives provided by paragraph (a) through (r). VEGP Units 3 and 4 uses the corrective action program to track, trend, correct and prevent recurrence of failures and deficiencies in the physical protection program.*

The NRC staff has reviewed the applicant's description in PSP Section 2 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(b), and is, therefore, acceptable.

13.6.4.1.3 Performance Evaluation Program

Requirements are established in 10 CFR 73.55(b)(4) through (b)(11) for the applicant to analyze and identify site-specific conditions, establish programs, plans, and procedures that address performance evaluations, access authorization, cyber security, insider mitigation, FFD, corrective actions, and operating procedures. 10 CFR 73.55(b)(6) prescribes specific requirements to establish, maintain, and implement a performance evaluation program in accordance with 10 CFR Part 73, Appendix B, Section VI for implementation of the plant protective strategy.

Section 3.0 of the PSP describes that drills and exercises, as discussed in the T&QP, will be used to assess the effectiveness of the contingency response plan and the effectiveness of the applicant's response strategy. Other assessment methods include formal and informal exercises or drills, self-assessments, internal and external audits and evaluations.

The performance evaluation processes and criteria that assess the effectiveness of the security program, including adequate protection against radiological sabotage, will be established in facility procedures and the deficiencies identified are managed through the corrective action program.

Section 3.0 of the PSP references Section 4.0 of the T&QP, which provides additional details related to the performance evaluation of security personnel in accordance with 10 CFR Part 73, Appendix B, Section VI. Section 4.0 of the T&QP includes the requirements to conduct security force tactical ~~dills~~ [drills] *and force-on-force exercises to evaluate security systems effectiveness and response performances of security personnel. In addition, Section 17 of the PSP describes additional detail regarding the applicant's processes for reviews, evaluations and audits that will complement the performance evaluation program.*

The NRC staff has reviewed the applicant's description in PSP Section 3, for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(b)(6), and is, therefore, acceptable.

13.6.4.1.4 Establishment of Security Organization

The provisions of 10 CFR 73.55(d) establish requirements to describe a security organization, including the management system for oversight of the physical protection program. The security organization must be designed, staffed, trained, qualified, re-qualified, and equipped to

implement the physical protection program as required by 10 CFR 73.55(b) and 10 CFR Part 73, Appendices B and C.

Section 4.0 of the PSP describes how the applicant meets the requirements of 10 CFR 73.55(d)(1).

Security Organization Management

Section 4.1 of the PSP describes the organization's management structure. The PSP establishes that the security organization is a critical component of the physical protection program and is responsible for the effective application of engineered systems, technologies, programs, equipment, procedures, and personnel necessary to detect, assess, interdict, and neutralize threats up to and including the DBT of radiological sabotage. The security organization may be proprietary, contractor, or other qualified personnel.

The PSP describes that the organization will be staffed with appropriately trained and equipped personnel, in a command structure with administrative controls and procedures, to provide a comprehensive response. Section 4.1 of the PSP also describes the roles and responsibilities of the Security Organization. The PSP provides that at least one full-time, dedicated Security Shift Team Leader that has the authority for command and control of all security operations is onsite at all times.

The security force implementing the security functions as described in this section of the plan will be either a proprietary force, contractor, or other qualified personnel. The training qualification requirements are described in the T&QP.

The NRC staff has reviewed the applicant's description in PSP Sections 4 and 4.1 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the meets the requirements of 10 CFR 73.55(d) and is, therefore, acceptable.

The following portion of this technical evaluation section is reproduced from Section 13.6.4.1 of the VEGP SER:

> *13.6.4.1.5 Qualification for Employment in Security*
>
> *The requirements of 10 CFR 73.55(d)(3) state, in part, that the applicant may not permit any individual to implement any part of the physical protection program unless the individual has been trained, equipped and qualified to perform assigned duties and responsibilities in accordance with Appendix B to 10 CFR Part 73 and the applicant's T&QP.*
>
> *Section 5 of the PSP describes that employment qualifications for members of the security force are delineated in the T&QP.*
>
> *The NRC staff has reviewed the applicant's description in PSP Section 5 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in*

NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(d)(3), and is, therefore, acceptable.

13.6.4.1.6 Training of Facility Personnel

Consistent with requirements in 10 CFR 73.55(d)(3),10 CFR 73.56, "Personnel access authorization requirements for nuclear power plants"; and 10 CFR Part 73, Appendix B, Section VI.C.1, all personnel who are authorized unescorted access to the applicant's PA receive training, in part to ensure that they understand their role in security and their responsibilities in the event of a security incident. Individuals assigned to perform security-related duties or responsibilities, such as, but not limited to, material searches and vehicle escort are trained and qualified in accordance with the T&QP to perform these duties and responsibilities and to ensure that each individual has the minimum knowledge, skills, and abilities required for effective performance of assigned duties and responsibilities.

Section 6 of the PSP describes the training provided for all personnel who have been granted unescorted access to the applicant's PA.

The NRC staff has reviewed the applicant's description in PSP Section 6 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.56 and 10 CFR Part 73, Appendix B, and is, therefore, acceptable.

13.6.4.1.7 Security Personnel Training

The provisions of 10 CFR 73.55(d) require that all security personnel are trained and qualified in accordance with 10 CFR Part 73, Appendix B, Section VI prior to performing their duties.

Section 7 of the PSP describes that all security personnel are trained, qualified and perform tasks at levels specific for their assignments in accordance with the applicant's T&QP.

The NRC staff has reviewed the applicant's description in PSP Section 7 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(d), and is, therefore, acceptable. The NRC staff's review of the licensee T&QP is located in Section 13.6.4.2 of this SER.

13.6.4.1.8 Local Law Enforcement Liaison

The following requirement is stated in 10 CFR 73.55(k)(9) "To the extent practicable, licensees shall document and maintain current agreements with applicable law enforcement agencies to include estimated response times and capabilities." In addition, 10 CFR 73.55(m)(2) requires, in part, that an evaluation of the effectiveness of the physical protection system include an audit of response commitments by local, State and Federal law enforcement authorities.

Section 8 of the PSP provides a detailed discussion of its ongoing relationship with local law enforcement agencies (LLEAs). The plans addressing response, communication methodologies and protocols, command and control structures and marshaling locations are located in the operations procedures, emergency plan procedures and the site-specific law enforcement response plan. The law enforcement response plan is reviewed biennially concurrent with the PSP effectiveness review.

The NRC staff has reviewed the applicant's description in PSP Section 8 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(k)(9) and 10 CFR 73.55(m)(2), and is, therefore, acceptable.

13.6.4.1.9 Security Personnel Equipment

The requirements of 10 CFR 73.55(d)(3) state, in part, the applicant may not permit any individual to implement any part of the physical protection program unless the individual has been trained, equipped and qualified in accordance with 10 CFR Part 73, Appendix B and the T&QP. The provisions of 10 CFR Part 73, Appendix B, Section VI.G.2(a) state, in part, that the applicant must ensure that each individual is equipped or has ready access to all personal equipment or devices required for the effective implementation of the NRC-approved security plans, the applicant's protective strategy, and implementing procedures. The provisions of 10 CFR Part 73, Appendix B, Sections VI.G.2(b) and (c) delineate the minimum equipment requirements for security personnel and armed response personnel.

Section 9 of the PSP describes the equipment, including armament, ammunition, and communications equipment that is provided to security personnel in order to ensure that security personnel are capable of performing the function stated in the Commission-approved security plans, applicant's protective strategy, and implementing procedures.

The NRC staff has reviewed the applicant's description in PSP Section 9 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(d)(3) and Appendix B, Section VI.G.2, and is, therefore, acceptable.

The following portion of this technical evaluation section is reproduced from Section 13.6.4.1 of the VEGP SER:

> *13.6.4.1.10 Work Hour Controls*
>
> *The provisions of 10 CFR Part 26, "Fitness for duty programs," Subpart I, "Managing Fatigue," establish the requirements for managing fatigue. 10 CFR 26.205 establishes requirements for work hours. 10 CFR 26.205(a) requires that any individual who performs duties identified in 10 CFR 26.4(a)(1) through (a)(5) shall be subject to the requirements of this section.*
>
> *Section 10 of the PSP describes that the site will implement work hour controls consistent with 10 CFR Part 26, Subpart I, and that site procedures shall describe performance objectives and implementing procedures.*
>
> *The NRC staff's review of the fitness-for-duty program is found in Section 13.7 of this SER.*

13.6.4.1.11 Physical Barriers

The following requirements are established in 10 CFR 73.55(e): "Each applicant shall identify and analyze site-specific conditions to determine the specific use, type, function, and placement of physical barriers needed to satisfy the physical protection program design requirements of 10 CFR 73.55(b). (1) The applicant shall: (i) Design, construct, install and maintain physical barriers as necessary to control access into facility areas for which access must be controlled or denied to satisfy the physical protection program design requirements of paragraph (b) of this section." The regulation 10 CFR 73.55(b)(3)(ii) states, "Provide defense-in-depth through the integration of systems, technologies, programs, equipment, supporting processes, and implementing procedures as needed to ensure the effectiveness of the physical protection program."

Section 11 of the PSP provides a general description of how the applicant has implemented its program for physical barriers, and that this implementation is in accordance with the performance objectives and requirements of 10 CFR 73.55(b).

Owner Controlled Area (OCA) Barriers

Section 11.1 of the PSP describes VCSNS use of OCA barriers at the site.

Vehicle Barriers

PSP Sections 11.2.1 and 11.2.2 establish and maintain vehicle control measures, as necessary, to protect against the DBT of radiological sabotage, consistent with the physical protection program design requirements of 10 CFR 73.55(b)(3)(ii) and 10 CFR 73.55(e)(10)(i), and in accordance with site-specific analysis. The PSP identifies measures taken to provide high assurance that such an event can be defended against. The applicant's PSP also provides that the inspection, monitoring, and maintenance of the vehicle barrier system (VBS) are included in the facility procedures.

Waterborne Threat Measures

The provisions of 10 CFR 73.55(e)(10)(ii) require the applicant to "Identify areas from which a waterborne vehicle must be restricted, and where possible, in coordination with local, State, and Federal agencies having jurisdiction over waterway approaches, deploy buoys, markers, or other equipment. In accordance with the site-specific analysis, provide periodic surveillance and observation of waterway approaches and adjacent areas."

Section 11.2.3 of the PSP describes that a site-specific analysis for a water-borne DBT has been conducted and documented. However, there is no waterborne access to VCSNS Units 2 and 3.

Protected Area Barriers

The provisions of 10 CFR 73.55(e)(8)(i) require that the protected area perimeter must be protected by physical barriers that are designed and constructed to: (1) limit access to only those personnel, vehicles, and materials required to perform official duties; (2) channel personnel, vehicles, and materials to designated access control portals; and (3) be separated from any other barrier designated as a vital area physical barrier, unless otherwise identified in the PSP.

The descriptions of the PA barrier are provided in the PSP Section 11.3. These descriptions meet the definitions of physical barriers and protected areas in 10 CFR 73.2 and requirements of 10 CFR 73.55(e)(8).

In RAI 13.6-13, the NRC staff asked for a description of measures taken to ensure that detection, assessment, observation, and surveillance requirements of 10 CFR 73.55 are met and appropriate barriers are installed to prevent potential exploitation of structures and buildings whose walls and roofs comprise a portion of the PA.

In its response the applicant stated that the RAI 13.6-5 response from VEGP Units 3 and 4, dated October 16, 2009, is applicable to VCSNS Units 2 and 3. The VEGP Units 3 and 4 response to RAI 13.6-15 provided an explanation of measures that the applicant will take when a structure or building comprises a portion of the PA barrier.

On the basis of its review, the NRC staff finds the response to RAI 13.6-13 to be acceptable as it provides clarification on how the applicant meets requirements for describing where buildings or structures comprise a portion of the PA, consistent with 10 CFR 73.55(e)(10)(iv).

Section 11.3 of the PSP describes the extent to which the protected area barrier at the perimeter is separated from a vital area/island barrier. The security plan identifies where the PA barrier is not separated from a vital area barrier.

Section 11.3 of the PSP describes isolation zones. As required in 10 CFR 73.55(e)(7), the isolation zone is maintained in outdoor areas adjacent to the protected area perimeter barrier and is designed to ensure the ability to observe and assess activities on either side of the protected area perimeter.

Vital Area Barriers

The provisions of 10 CFR 73.55(e)(9) require that "Vital equipment must be located only within vital areas, which must be located within a protected area so that access to vital equipment requires passage through at least two physical barriers, except as otherwise approved by the Commission and identified in the security plans." In addition, 10 CFR 73.55(e)(5) requires that certain vital areas shall be bullet resisting.

Section 11.4 of the PSP describes that vital areas are restricted access areas surrounded by physical barriers with the capability to restrict access to only authorized individuals. All vital areas are constructed in accordance with established regulatory requirements. Section 11.4 also describes that the reactor control room, central alarm station (CAS) and the location within which the last access control function for access to the protected area is performed, must be bullet resisting.

Target Set Equipment

The provisions of 10 CFR 73.55(f) require the following, "The licensee shall document and maintain the process used to develop and identify target sets, to include the site-specific analyses and methodologies used to determine and group the target set equipment or elements. The licensee shall consider cyber attacks in the development and identification of target sets. Target set equipment or elements that are not contained within a protected or vital area must be identified and documented consistent with the requirements in 10 CFR 73.55(f)(1) and be accounted for in the licensee's protective strategy. The licensee shall implement a process for the oversight of target set equipment and systems to ensure that changes to the configuration of the identified equipment and systems are considered in the licensee's protective strategy. Where appropriate, changes must be made to documented target sets."

Section 11.5 of the PSP describes that target set equipment or elements that are not contained within a protected or vital area are identified and accounted for in the site protective strategy.

The staff identified several RAIs relating to target sets for the purpose of reviewing the Westinghouse physical protection program. Westinghouse provided design details as background information to assist an applicant with the development of site-specific target set analyses. The staff evaluated the applicant's responses, and found them to be acceptable for the DC review of the AP1000 physical protection program. Westinghouse stated, in TR-94 that target sets were created to aid in the development of the AP1000 physical security system, and that final target sets will be developed by the COL applicant prior to fuel onsite (inside PA).

The NRC staff has reviewed the applicant's description in Sections 11.5 and 14.5 of the PSP, Section 7 of the SCP and information in Westinghouse TR-94, for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in Sections 11.5 and 14.5 of the PSP, Section 7 of the SCP and the information in Westinghouse TR-94 are consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the Sections 11.5 and 14.5 of the PSP and Section 7 of the SCP meets the requirements of 10 CFR 73.55(f)(1), (3), and (4), and is, therefore, acceptable. The target sets, target set analysis and site protective strategy are in the facility implementing procedures, which were not subject to an NRC staff review as part of this COL application, and are, therefore, subject to future NRC inspections in accordance with 10 CFR 73.55(c)(7)(iv) and 10 CFR Part 73, Appendix C, Section II.B.5(iii).

Delay Barriers

The provisions of 10 CFR 73.55(e)(3)(C)(ii) require that physical barriers must "provide deterrence, delay, or support access control" to perform the required function of the applicant physical protection program. The PSP describes the use of delay barriers at VCSNS Units 2 and 3.

Section 11.6 of the PSP includes a description of the use of Delay Barriers to meet requirement of 10 CFR 73.55(e).

The NRC staff has reviewed the applicant's description in PSP Sections 11, 11.1, 11.2, 11.2.1, 11.2.2, 11.2.3, and Sections 11.3 through 11.6 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meet the requirements of 10 CFR 73.55(e), and are, therefore, acceptable.

The following portion of this technical evaluation section is reproduced from Section 13.6.4.1 of the VEGP SER:

> *13.6.4.1.12 Security Posts and Structures*
>
> *The provisions of 10 CFR 73.55(e)(5) require that the reactor control room, the CAS, and the location within which the last access control function for access to the PA is performed, must be bullet-resisting.*
>
> *Section 12 of the PSP describes that security posts and structures are qualified to a level commensurate with their application within the site protective strategy, and that these positions are constructed of bullet resisting materials.*
>
> *The NRC staff has reviewed the applicant's description in PSP Section 12 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(e)(5), and is, therefore, acceptable.*
>
> *13.6.4.1.13 Access Control Devices*
>
> *It is stated in 10 CFR 73.55(g)(1) that, consistent with the function of each barrier or barrier system, the applicant shall control personnel, vehicle, and material access, as applicable, at each access control point in accordance with the physical protection program design requirements of 10 CFR 73.55(b).*
>
> *The provisions of 10 CFR 73.55(g)(6) require control of access control devices as stated: "The licensee shall control all keys, locks, combinations, passwords and related access control devices used to control access to protected areas, vital areas and security systems to reduce the probability of compromise."*

Types of Security-Related Access Control Devices

Section 13.1 of the PSP describes that the applicant uses security-related access control devices to control access to protected and vital areas and security systems.

Control and Accountability

Section 13.2.1 of the PSP describes the control of security related locks. Section 13.2.2 of the PSP describes the controls associated with the changes to and replacements of access control devices and the accountability and inventory control process, and the circumstances that require changes in security-related locks. The applicant uses facility procedures to produce, control, and recover keys, locks, and combinations for all areas and equipment, which serve to reduce the probability of compromise. The issue of access control devices is limited to individuals who have unescorted access authorization and require access to perform official duties and responsibilities. Keys and locks are accounted for through a key inventory control process as described in facility procedures.

The NRC staff has reviewed the applicant's description in PSP Sections 13, 13.1, 13.2, 13.2.1, and 13.2.2 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meet the requirements of 10 CFR 73.55(g)(1) and (6), and are, therefore, acceptable.

13.6.4.1.14 Access Requirements

Access Authorization and Fitness for Duty

The provisions of 10 CFR 73.55(b)(7) require the applicant shall establish, maintain, and implement an access authorization program in accordance with 10 CFR 73.56 and shall describe the program in the PSP. The provisions of 10 CFR Part 26 require the applicant to establish and maintain a FFD program.

Section 14.1 of the PSP describes that the access authorization program implements regulatory requirements utilizing the provisions in RG 5.66.

The NRC staff has reviewed the applicant's description in PSP Section 14.1 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(b)(7), 10 CFR 73.56 and 10 CFR Part 26 and is, therefore, acceptable.

Insider Mitigation Program

The provisions of 10 CFR 73.55(b)(9) require that the applicant shall establish, maintain, and implement an insider mitigation program and shall describe the program in the PSP. The insider mitigation program must monitor the initial and continuing trustworthiness and reliability

of individuals granted or retaining unescorted access authorization to a protected or vital area, and implement defense-in-depth methodologies to minimize the potential for an insider to adversely affect, either directly or indirectly, the applicant's capability to prevent significant core damage and spent fuel sabotage. The insider mitigation program must include elements from: the access authorization program, the FFD program, the cyber security program and the physical protection program.

Section 14.2 of the PSP describes how the applicant will establish, maintain, and implement an insider mitigation program. The insider mitigation program requires elements from the access authorization program described in 10 CFR 73.56; FFD program described in 10 CFR Part 26; the cyber security program described in 10 CFR 73.54; and the physical security program described in 10 CFR 73.55. In addition, Section 14.2 describes the integration of the programs mentioned above to form a cohesive and effective insider mitigation program. The applicant addresses the observations for the detection of tampering. The NRC staff finds that this approach is an acceptable method for meeting the requirements 10 CFR 73.55(b)(9).

The NRC staff has reviewed the applicant's description in PSP Section 14.2 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(b)(9) and is, therefore, acceptable.

Picture Badge Systems

Requirements for badges are stated in 10 CFR 73.55(g)(6)(ii). "The licensee shall implement a numbered photo identification badge system for all individuals authorized unescorted access to the protected area and vital areas." In addition, identification badges may be removed from the protected area under limited conditions and only by authorized personnel. Records of all badges shall be retained and shall include name and areas to which persons are granted unescorted access.

The provisions of 10 CFR 73.55(g)(7)(ii) require that individuals not employed by the applicant but who require frequent or extended unescorted access to the protected area and/or vital areas to perform duties and responsibilities required by the applicant at irregular or intermittent intervals, shall satisfy the access authorization requirements of 10 CFR 73.56 and 10 CFR Part 26 of this chapter, and shall be issued a non-employee photo identification badge that is easily distinguished from other identification badges before being allowed unescorted access to the protected and vital areas. Non-employee photo identification badges must visually reflect that the individual is a non-employee and that no escort is required.

Section 14.3 of the PSP describes the site picture badge system. Identification badges will be displayed while individuals are inside the protected area or vital areas. When not in use, badges may be removed from the protected area by authorized holders, provided that a process exists to deactivate the badge upon exit and positively confirm the individual's true identity and authorization for unescorted access prior to entry into the protected area. Records are maintained to include the name and areas to which unescorted access is granted of all individuals to whom photo identification badges have been issued.

The NRC staff has reviewed the applicant's description in PSP Section 14.3 for the implementation of the site-specific physical protection program in accordance with Commission

regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(g)(6) and (7) and is, therefore, acceptable.

Searches

The provisions of 10 CFR 73.55(h) require, in part, that applicants meet the objective to detect, deter, and prevent the introduction of firearms, explosives, incendiary devices, or other items, which could be used to commit radiological sabotage. To accomplish this, applicant's shall search individuals, vehicles, and materials consistent with the physical protection program design requirements in paragraph (b) of this section, and the function to be performed at each access control point or portal before granting access.

Section 14.4 of the PSP provides an overview description of the search process for vehicle, personnel and materials. The search process is conducted using security personnel, specifically trained non-security personnel and technology. Detailed discussions of actions to be taken in the event unauthorized materials are discovered are found in implementing procedures.

Vehicle Barrier Access Control Point

The provisions of 10 CFR 73.55(h)(2)(ii) through (v) provide the requirements the applicant to search vehicles at the owner controlled area and 10 CFR 73.55(h)(3) provides requirements for searches of personnel, vehicles and materials prior to entering the protected area.

Section 14.4.1 of the PSP describes the process for the search of personnel, vehicles and materials at predetermined locations prior to granting access to designated facility areas identified by the applicant as needed to satisfy the physical protection program. The applicant states that it has developed specific implementing procedures to address vehicle and materials searches at these locations.

PA Packages and Materials Search

Section 14.4.2 of the PSP describes the process for conducting searches of packages and materials for firearms, explosives, incendiary devices, or other items, which could be used to commit radiological sabotage using equipment capable of detecting these items or through visual and physical searches, or both, to ensure that all items are clearly identified before these items can enter the VCSNS Units 2 and 3 protected area. Detailed requirements for conducting these searches are found in applicant implementing procedures and include the search and control of bulk materials and products. Applicant implementing procedures also discuss the control of packages and materials previously searched and tamper sealed by personnel trained in accordance with the T&QP.

PA Vehicle Search

Section 14.4.3 of the PSP describes the process for the search of vehicles for firearms, explosives, incendiary devices, or other items, which could be used to commit radiological sabotage using equipment capable of detecting these items or through visual and physical searches, or both, to ensure that all items are clearly identified at the protected area. Detailed requirements for conducting these searches are found in the applicant's implementing

procedures. The applicant's implementing procedures also address the search methodologies for vehicles that must enter the protected area under emergency conditions.

PA Personnel Searches

Section 14.4.4 of the PSP describes the process for searches of all personnel requesting access into protected areas. The PSP describes the search for firearms, explosives, incendiary devices, or other items, which could be used to commit radiological sabotage using equipment capable of detecting these items or through visual and physical searches or both to ensure that all items are clearly identified prior to granting access into the protected area. All persons except official Federal, State, and LLEA personnel on official duty are subject to these searches upon entry to the PA. Detailed discussions of observation and control measures are found in implementing procedures.

PA Access Controls

Section 14.4.5 of the PSP describes the process for controlling access at all points where personnel or vehicles could gain access into the applicant's PA. The plan notes that principal personnel access to the PA is through a lockable portal. Personnel are only permitted into the PA after positive ID verification, access authorization verification, and a search is performed in accordance with Section 14.4 of the PSP. Vehicles are controlled through positive control methods described in the facility procedures.

Escort and Visitor Requirements

The provisions of 10 CFR 73.55(g)(7) state in part, that the applicant may permit escorted access to protected and vital areas to individuals who have not been granted unescorted access in accordance with the requirements of 10 CFR 73.56 and 10 CFR Part 26 of this chapter. 10 CFR 73.55(g)(8) discusses escort requirements. Applicants are required to implement procedures for processing, escorting and controlling visitors. Procedures shall address confirmation of identity of visitors, maintenance of a visitor control register, visitor badging and escort controls including, training, communications, and escort ratios.

Section 14.4.6 of the PSP describes the process for control of visitors. The PSP affirms that procedures address the identification, processing, and escorting of visitors and the maintenance of a visitor control register. Training requirements for escorting visitors includes responsibilities, communications and escort ratios. All escorts are trained to perform escort duties in accordance with site requirements. All visitors wear a badge that clearly indicates that an escort is required.

The NRC staff has reviewed the applicant's description in PSP Sections 14.4, and 14.4.1 through 14.4.6 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(h)(2), (h)(3), (g)(7) and (g)(8), and are, therefore, acceptable.

Vital Area Access Controls

The provisions of 10 CFR 73.55(g)(4) require that applicants control access into vital areas consistent with established access authorization lists. In response to a site-specific credible

threat or other credible information, applicants shall implement a two-person (line-of-sight) rule for all personnel in vital areas so that no one individual is permitted access to a vital area.

The provisions of 10 CFR 73.56(j) require the applicant to establish, implement, and maintain a list of individuals who are authorized to have unescorted access to specific nuclear power plant vital areas during non-emergency conditions. The list must include only those individuals who have a continued need for access to those specific vital areas in order to perform their duties and responsibilities. The list must be approved by a cognizant applicant manager or supervisor who is responsible for directing the work activities of the individual who is granted unescorted access to each vital area, and updated and re-approved no less frequently than every 31 days.

Section 14.5 of the PSP describes vital areas and states that the applicant maintains vital areas locked and protected by an active intrusion alarm system. An access authorization system is established to limit unescorted access that is controlled by an access authorization list, which is reassessed and reapproved at least once every 31 days. Additional access control measures are described in the facility procedures.

The NRC staff has reviewed the applicant's description in PSP Section 14.5 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(g)(4) and is, therefore, acceptable.

The following portion of this technical evaluation section is reproduced from Section 13.6.4.1 of the VEGP SER:

> *13.6.4.1.15 Surveillance Observation and Monitoring*
>
> *The provisions of 10 CFR 73.55(i)(1) require that the applicant establish and maintain intrusion detection systems that satisfy the design requirements of 10 CFR 73.55(b) and provide, at all times, the capability to detect and assess unauthorized persons and facilitate the effective implementation of the protective strategy.*
>
> *Illumination*
>
> *The provisions of 10 CFR 73.55(i)(6) require, in part, that all areas of the facility are provided with illumination necessary to satisfy the design requirements of 10 CFR 73.55(b) and implement the protective strategy. Specific requirements include providing a minimum illumination level of 0.2 foot-candles, measured horizontally at ground level, in the isolation zones and appropriate exterior areas within the PA. Alternatively, the applicant may augment the facility illumination system by means of low-light technology to meet the requirements of this section or otherwise implement the protective strategy. The applicant shall describe in the security plans how the lighting requirements of this section are met and, if used, the type(s) and application of low-light technology.*
>
> *Section 15.1 of the PSP describes that all isolation zones and appropriate exterior areas within the PA have lighting capabilities that provide illumination sufficient for the initiation of an adequate response to an attempted intrusion of*

the isolation zone, a PA, or a vital area. A discussion of the implementation of technology using fixed and non-fixed low light level cameras or alternative technological means is provided. The applicant has addressed the potential for loss of lighting and the compensatory actions that would be taken if that event were to occur.

Surveillance Systems

The provisions of 10 CFR 73.55(i)(1) require, in part, that the applicant implement, establish, and maintain intrusion detection and assessment, surveillance, observation and monitoring systems to satisfy the design requirements of 10 CFR 73.55(b), and of the applicant's OCA.

Section 15.2 of the PSP describes that surveillance is accomplished by human observation and technology. Surveillance systems include a variety of cameras, video display, and annunciation systems designed to assist the security organization in observing, detecting assessing alarms or unauthorized activities. Certain systems provide real-time and recorded play back of recorded video images. The specifics of surveillance systems are described in facility implementing procedures.

Intrusion Detection Equipment

Section 15.3 of the PSP describes the perimeter intrusion detection system, and the PA and vital area intrusion detection systems. These systems are capable of detecting attempted penetration of the PA perimeter barrier; are monitored with assessment equipment designed to satisfy the requirements of 10 CFR 73.55(i) and provide real-time and play-back/recorded video images of the detected activities before and after each alarm annunciation. The PSP describes how the applicant will meet regulatory requirements for redundancy, tamper indication and uninterruptable power supply.

Central Alarm Station (CAS) and Secondary Alarm Station (SAS) Operation

The provisions of 10 CFR 73.55(i)(4) provide requirements for alarm stations. It is required, in 10 CFR 73.55(i)(4)(i), that both alarm stations must be designed and equipped to ensure that a single act, in accordance with the DBT of radiological sabotage defined in 10 CFR 73.1, cannot disable both alarm stations. The applicant shall ensure the survivability of at least one alarm station to maintain the ability to perform the following functions: 1) detect and assess alarms; 2) initiate and coordinate an adequate response to an alarm; 3) summon offsite assistance; and 4) provide command and control. 10 CFR 73.55(i)(4)(iii) requires that alarm stations must be equal and redundant.

Section 15.4 of the PSP describes the functional operations of the CAS and the SAS. The PSP provides that the alarm stations are equipped, such that no single act will disable both alarm stations. The applicant's PSP provides that each alarm station is properly manned and that no activities are permitted that would interfere with the operator's ability to execute assigned duties and responsibilities.

Security Patrols

Owner Controlled Area (OCA) Surveillance and Response

The provisions of 10 CFR 73.55(e)(6) require that the applicant establish and maintain physical barriers in the OCA as needed to satisfy the physical protection program design requirements of 10 CFR 73.55(b). It is required, in 10 CFR 73.55(i)(5)(ii), in part, that the applicant provide continuous surveillance, observation and monitoring of the OCA and that these responsibilities may be performed by security personnel during continuous patrols, through the use of video technology, or by a combination of both.

Section 15.5.1 of the PSP describes the processes used to meet this requirement. The PSP discusses the process to be used and provides that details regarding the implementation of OCA surveillance techniques are found in facility procedures. The PSP provides a discussion regarding the implementation of manned and video options for patrolling and surveillance of the OCA.

Protected and Vital Area Patrols

The provisions of 10 CFR 73.55(i)(5)(iii) through (viii) require, in part, that armed patrols check unattended openings that intersect a security boundary, such as an underground pathways, check external areas of the PA and vital area portals, periodically inspect vital areas, conduct random patrols of accessible target set equipment, be trained to recognize obvious tampering and if detected, initiate an appropriate response in accordance with established plans and procedures.

Section 15.5.2 of the PSP describes the process employed by the applicant to meet the above requirements. The PSP describes the areas of the facility that will be patrolled and observed, as well as the frequency of these patrols and observations. The applicant has addressed the observations for the detection of tampering in Section 14.2 of the PSP and in the facility procedures.

The NRC staff has reviewed the applicant's description in PSP Sections 15, 15.1 through 15.4, 15.5.1, and 15.5.2 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(b) and (i), and are, therefore, acceptable.

13.6.4.1.16 Communications

The provisions of 10 CFR 73.55(j)(1) through (6) describe the requirements for establishment and maintenance of continuous communication capabilities with both onsite and offsite resources to ensure effective command and control during both normal and emergency situations. Alarm stations must be capable of calling for assistance, on-duty security force personnel must be capable of maintaining continuous communication with each alarm station and vehicle escorts, and personnel escorts must maintain timely communication with security personnel. Continuous communication capabilities must terminate in both alarm stations,

between LLEA and the control room. Non-portable communications must remain operable from independence power sources. The applicant must identify areas where communications could be interrupted or not maintained.

Notifications (Security Contingency Event Notifications)

Section 16.1 of the PSP describes that the applicant have a process to ensure that continuous communications are established and maintained between the onsite security force staff and the offsite support agencies.

System Descriptions

Section 16.2 of the PSP describes the establishment and maintenance of the communications system. Detailed descriptions of security systems are included in the facility procedures. VEGP has access to both hard wired and alternate communications systems. Site security personnel are assigned communications devices with which to maintain continuous communications with the CAS and SAS. All personnel and vehicles are assigned communications resources with which to maintain continuous communications. Continuous communication protocols are available between the CAS, SAS and the control room.

The NRC staff has reviewed the applicant's description in PSP Sections 16, 16.1 and 16.2 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(j)(1) through (6), and are, therefore, acceptable.

13.6.4.1.17 Review, Evaluation and Audit of the Physical Security Program

The provisions of 10 CFR 73.55(m) require, in part, that each element of the physical protection program will be reviewed at least every 24 months. An initial review is required within 12 months after original plan implementation, or a change in personnel, procedures, equipment or facilities, which could have a potentially adverse affect on security, or as necessary based on site-specific analysis assessments, or other performance indicators. Reviews must be conducted by individuals independent of the security program and must include the plans, implementing procedures and local law enforcement commitments. Results of reviews shall be presented to senior management above the level of the security manager and findings must be entered in the site corrective action program.

Section 17 of the PSP describes that the physical security program is reviewed 12 months following initial implementation and at least every 24 months by individuals independent of both security program management and personnel who have a direct responsibility for implementation of the security program. The physical security program review includes, but is not limited to, an audit of the effectiveness of the physical security program, cyber security plans, implementing procedures, safety/security interface activities, the testing,

maintenance, and calibration program, and response commitments by local, State, and Federal law enforcement authorities.

A review shall be conducted as necessary based upon site-specific analyses, assessments, or other performance indicators and as soon as reasonably practical, but no longer than 12 months, after changes occur in personnel, procedures, equipment, or facilities that potentially could adversely affect safety/security.

The results and recommendations of the physical security program review, management's finding on whether the physical security program is currently effective and any actions taken as a result of recommendations from prior program reviews are documented in a report to plant management and to appropriate corporate management at least one level higher than that having responsibility for the day-to-day plant operation. These reports are maintained in an auditable form and maintained for inspection.

Findings from the onsite physical security program reviews are entered into the facility corrective action program.

In RAI 13.6-36, the NRC staff requested that the applicant address the requirements of 10 CFR 73.58, "Safety/security requirements for nuclear power reactors." In its response dated May 14, 2010, the applicant stated that management controls and processes used to establish and maintain an effective interface between nuclear safety and physical security are addressed by administrative procedures. The applicant committed to revise VEGP COL FSAR Section 13.5.1 to include the safety/security interface implementation process in the list of procedural instructions provided in plant administrative procedures.

On the basis of its review, the NRC staff finds that since the applicant will revise VEGP COL FSAR Section 13.5.1 to incorporate the requirements for safety/security interfaces, the response to RAI 13.6-36 meets the requirements of 10 CFR 73.58 and is, therefore, acceptable. The incorporation of changes to the VEGP COL FSAR Section 13.5.1 is being tracked as ***Confirmatory Item 13.6-2****.*

Resolution of Standard Content Confirmatory Item 13.6-2

Confirmatory Item 13.6-2 is an applicant commitment to revise its FSAR Section 13.5 regarding the requirements of safety/security interfaces. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 13.6-2 is now closed.

The NRC staff has reviewed the applicant's description in PSP Section 17 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(m), and is, therefore, acceptable.

13.6.4.1.18 Response Requirements

The provisions of 10 CFR 73.55(k) require, in part, that the applicant establish and maintain a properly trained, qualified, and equipped security force required to interdict and neutralize threats up to and including the DBT defined in 10 CFR 73.1, to prevent significant core damage and spent fuel sabotage. To meet this objective, the applicant must ensure that necessary equipment is in supply, working, and readily available. The applicant must ensure training has been provided to all armed members of the security organization who will be available onsite to implement the applicant's protective strategy as described in the facility procedures and 10 CFR Part 73, Appendix C. The applicant must have facility procedures to reconstitute armed response personnel and have established working agreement(s) with LLEA. The applicant must have implemented a threat warning system to accommodate heightened security threats and coordination with NRC representatives.

Section 18 of the PSP describes an armed response team, responsibilities, training, and equipment, and requires an adequate number of armed response force personnel immediately available at all times to implement each site's protective strategy. The applicant ensures that training is conducted in accordance with the requirements of 10 CFR Part 73, Appendix B that will ensure implementation of the site protective strategy in accordance with 10 CFR Part 73, Appendix C. Procedures are in place to reconstitute the armed response personnel as are agreements with LLEA. Procedures are in place to manage the threat warning system.

The NRC staff has reviewed the applicant's description in PSP Section 18 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(k) and is, therefore, acceptable.

The following portion of this technical evaluation section is reproduced from Section 13.6.4.1 of the VEGP SER:

> *13.6.4.1.19 Special Situations Affecting Security*
>
> *The provisions of 10 CFR 73.58 require that each operating nuclear power reactor applicant with a license issued under 10 CFR Part 50, or 10 CFR Part 52 shall comply with the following requirements: the applicant shall assess and manage the potential for adverse effects on safety and security, including the site emergency plan, before implementing changes to plant configurations, facility conditions, or security; the scope of changes to be assessed and managed must include planned and emergent activities (such as, but not limited to, physical modifications, procedural changes, changes to operator actions or security assignments, maintenance activities, system reconfiguration, access modification or restrictions, and changes to the security plan and its implementation); where potential conflicts are identified, the applicant shall communicate them to appropriate personnel and take compensatory and/or mitigative actions to maintain safety and security under applicable Commission regulations, requirements, and license conditions.*
>
> *Section 19 of the PSP includes requirements for assessments to manage increased risk of special situations affecting security.*

Refueling/Major Maintenance

Section 19.1 of the PSP describes that, for refueling or major maintenance activities, the PSP describes that security procedures identify measures for implementation of actions prior to refueling or major maintenance activities. These measures include controls to ensure that a search is conducted prior to revitalizing an area, that protective barriers and alarms are fully operational, and post-maintenance performance testing to ensure operational readiness of equipment in accordance with 10 CFR 73.55(n)(8).

Construction and Maintenance

Section 19.2 of the PSP describes that during periods of construction and maintenance when temporary modifications are necessary, that the applicant will implement measures that provide for equivalency in the physical protective measures and features impacted by the activities, such that physical protection measures are not degraded. The process for making such changes or modifications is included in the facility procedures.

The NRC staff has reviewed the applicant's description in PSP Sections 19, 19.1, and 19.2 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(n)(8) and 10 CFR 73.58, and are, therefore, acceptable.

13.6.4.1.20 Maintenance, Testing and Calibration

In accordance with 10 CFR 73.55(n), the applicant is required to establish, maintain, and implement a maintenance, testing, and calibration program to ensure that security systems and equipment, including secondary and uninterruptible power supplies, are tested for operability and performance at predetermined intervals, maintained in operable condition, and have the capability of performing their intended functions. The regulation requires that the applicant describe their maintenance testing and calibrations program in the PSP, and that the implementing procedures describe the details and intervals for conducting these activities. Applicant procedures must identify criteria for documenting deficiencies in the corrective action program and ensuring data protection in accordance with 10 CFR 73.21. The applicant must conduct periodic operability testing of the intrusion alarm system and must conduct performance testing in accordance with the PSP and implementing procedures. Communication equipment must be tested not less than daily, and search equipment must also be tested periodically. Procedures must be established for testing equipment located in hazardous areas, and procedures must be established for returning equipment to service after each repair.

Sections 20.1 through 20.6 of the PSP describe the maintenance, testing and calibration program for security-related equipment. Section 20.1 states that the applicant shall conduct intrusion detection testing in accordance with

recommended testing procedures described in RG 5.44," Perimeter Intrusion Alarm System". Each operational component required for the implementation of the security program is at a minimum, tested in accordance with 10 CFR 73.55(n), the PSP and implementing procedures.

The NRC staff has reviewed the applicant's description in PSP Sections 20 and 20.1 through 20.6 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(n), and are, therefore, acceptable.

13.6.4.1.21 Compensatory Measures

The provisions of 10 CFR 73.55(o) require, in part, that the applicant shall identify criteria and measures to compensate for degraded or inoperable equipment, systems, and components to meet the requirements of this section. Compensatory measures must provide a level of protection that is equivalent to the protection that was provided by the degraded or inoperable, equipment, system, or components. Compensatory measures must be implemented within specific time frames necessary to meet the appropriate portions of 10 CFR 73.55(b) and described in the security plans.

Section 21 of the PSP identifies measures and criteria required to compensate for degraded or inoperable equipment, systems, and components in accordance with 10 CFR 73.55(o) to assure that the effectiveness of the physical protection system is not reduced by failure or other contingencies affecting the operation of the security-related equipment or structures. Sections 21.1 through 21.12 of the PSP address PA and vital area barriers, intrusion detection and alarm systems, lighting, fixed and non-fixed closed circuit television, play-back and recorded video systems, computer systems, access control devices, vehicle barrier systems, channeling barrier systems, and other security-related equipment.

The NRC staff has reviewed the applicant's description in PSP Sections 21 and 21.1 through 21.12, for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(o), and are, therefore, acceptable.

13.6.4.1.22 Records

The provisions of 10 CFR Part 26, 10 CFR 73.55(q), 10 CFR 73.56(k) and (o), 10 CFR Part 73, Appendix B. Section VI.H., Appendix C, Section II.C and 10 CFR 73.70, "Records," require that the applicant must retain and maintain all records required to be kept by the Commission regulations, orders, or license conditions until the Commission terminates the license for which the records were developed, and shall maintain superseded portions of these records for at least three years after the record is superseded, unless otherwise specified by

the Commission. The applicant is required to keep records of contracts with any contracted security force that implements any portion of the onsite physical protection program for the duration of the contract. The applicant must make all records, required to be kept by the Commission, available to the Commission and the Commission may inspect, copy, retain and remove all such records, reports and documents, whether kept by the applicant or a contractor. Review and audit reports must be maintained and available for inspection for a period of three years.

Section 22.0 of the PSP addresses the requirements to maintain records. Sections 22.1 through 22.13 address each kind of record that the applicant will maintain and the duration of retention for each record. The following types of records are maintained in accordance with the above mention regulations: access authorization records; suitability, physical and psychological qualification records for security personnel; PA and vital area access control records; PA visitor access records; PA vehicle access; vital area access transaction records; vitalization and de-vitalization records; vital area access list reviews; security plans and procedures; security patrols, inspections and tests; maintenance; CAS and SAS alarm annunciation and security response records; local law enforcement agency records; records of audits and reviews; access control devices; security training and qualification records; firearms testing and maintenance records; and engineering analysis for the vehicle barrier system.

The NRC staff has reviewed the applicant's description in PSP Sections 22 and 22.1 through 22.13 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(q), 10 CFR 73.55(o) and 10 CFR 73.70, and are, therefore, acceptable.

13.6.4.1.23 Digital Systems Security

Section 23 of the PSP addresses digital systems security. The applicant stated in its PSP that it has implemented the requirements of 10 CFR 73.54 and maintains a cyber security plan that describes how it has provided high assurance that safety, security, and emergency preparedness functions are protected against the DBT.

The NRC staff's review of the cyber security plan is found Section 13.8 of this SER.

13.6.4.1.24 Temporary Suspension of Security Measures

The provisions of 10 CFR 73.55(p) allow the applicant to "suspend implementation of affected requirements of this section under the following conditions: In accordance with 10 CFR 50.54(x) and 10 CFR 50.54(y) of this chapter, the licensee may suspend any security measures under this section in an emergency when this action is immediately needed to protect the public health and safety and no action consistent with license conditions and technical

specifications that can provide adequate or equivalent protection is immediately apparent. This suspension of security measures must be approved as a minimum by a licensed senior operator before taking this action. During severe weather when the suspension of affected security measures is immediately needed to protect the personal health and safety of security force personnel and no other immediately apparent action consistent with the license conditions and technical specifications can provide adequate or equivalent protection. This suspension of security measures must be approved, as a minimum, by a licensed senior operator, with input from the security supervisor or manager, before taking this action."

Suspension of Security Measures in Accordance with 10 CFR 50.54(x) and (y)

Section 24.1 of the PSP addresses suspension of security measures in accordance with 10 CFR 50.54(x) and 10 CFR 50.54(y). Specifically, the plan provides a description of the conditions under which suspension is permissible, the authority for suspension, and the requirements for reporting such a suspension.

Suspension of Security Measures during Severe Weather or Other Hazardous Conditions

As required in 10 CFR 73.55(p), suspension of security measures are reported and documented in accordance with the provisions of 10 CFR 73.71, "Reporting of safeguards events.". This suspension of security measures must be approved, as a minimum, by a licensed senior operator, with input from the security supervisor or manager, before taking this action. Suspended security measures must be reinstated as soon as conditions permit.

Section 24.2 of the PSP provides that certain security measures may be temporarily suspended during circumstances such as imminent, severe or hazardous weather conditions, but only when such action is immediately needed to protect the personal health and safety of security force personnel and no other immediately apparent action consistent with the security measures can provide adequate or equivalent protection. Under the PSP, suspended security measures shall be restored as soon as practical.

The NRC staff has reviewed the applicant's description in PSP Sections 24, 24.1, and 24.2 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the PSP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the PSP meets the requirements of 10 CFR 73.55(p), and are, therefore, acceptable.

13.6.4.1.25 Appendix A Glossary of Terms and Acronyms

Appendix A, "Glossary of Terms and Acronyms," was reviewed and found to be consistent with the NRC endorsed NEI 03-12, Revision 6 template.

13.6.4.1.26 Conclusions on the Physical Security Plan

On the basis of the NRC staff's review described in Sections 13.6.4.1.1 through 13.6.4.1.25 of this SER, the PSP meets the requirements of 10 CFR 73.55(a) through (r). The target sets, Target Set Analysis and Site Protective Strategy are in the facility implementing procedures, which were not subject to NRC staff review as part of this COL application and are, therefore, subject to future NRC inspection in accordance with 10 CFR 73.55(c)(7)(iv) and 10 CFR Part 73, Appendix C, Section II.B.5(iii). The NRC staff concludes that complete and procedurally correct implementation of the PSP will provide high assurance that activities involving special nuclear material are not inimical to the common defense and security and do not constitute an unreasonable risk to the public health and safety.

13.6.4.2 <u>Appendix B Training and Qualification Plan</u>

13.6.4.2.1 Introduction

The provisions of 10 CFR 73.55(c)(4) state that the applicant establish, maintain, implement, and follow a T&QP that describes how the criteria set forth in 10 CFR Part 73, Appendix B will be implemented.

The provisions of 10 CFR 73.55(d)(3) state that the applicant may not permit any individual to implement any part of the physical protection program unless the individual has been trained, equipped, and qualified to perform their assigned duties and responsibilities in accordance with 10 CFR Part 73, Appendix B and the T&QP. Non-security personnel may be assigned duties and responsibilities required to implement the physical protection program and shall:

- *(i) Be trained through established applicant training programs to ensure each individual is trained, qualified, and periodically requalified to perform assigned duties.*
- *(ii) Be properly equipped to perform assigned duties.*
- *(iii) Possess the knowledge, skills, and abilities to include physical attributes, such as sight and hearing, required to perform their assigned duties and responsibilities.*

In addition, 10 CFR Part 73, Appendix B, Section VI.D.2(a) states armed and unarmed individuals shall be requalified at least annually in accordance with the requirements of the Commission-approved T&QP.

The T&QP describes that it is written to address the requirements found in 10 CFR Part 73, Appendix B, Section VI. The objective of the plan is to provide a mechanism to ensure that members of the security organization, and all others who have duties and responsibilities in implementing the security requirements and protective strategy, are properly trained, equipped and qualified. Deficiencies identified during the administration of T&QP requirements are documented in the site corrective action program.

The NRC staff has reviewed the introduction section in the T&QP and has determined that it includes all of the programmatic elements necessary to satisfy the requirements of 10 CFR 73.55 and 10 CFR Part 73, Appendix B, Section VI applicable to the T&QP. Additional section-by-section evaluations and discussions are found in the following paragraphs.

13.6.4.2.2 Employment Suitability and Qualification

The requirements for mental qualifications, documentation, and physical requalification for security personnel (applicant employee and contractor) are described in the following T&QP sections.

Suitability

The provisions of 10 CFR Part 73, Appendix B, Section VI.B.1(a) require, in part, that before employment, or assignment to the security organization, an individual shall: (1) possess a high school diploma or pass an equivalent performance examination designed to measure basic mathematical, language, and reasoning skills, abilities, and knowledge required to perform security duties and responsibilities; (2) attained the age of 21 for an armed capacity or the age of 18 for an unarmed capacity; (3) not have any felony convictions that reflect on the individual's reliability; and (4) individuals in an armed capacity would not be disqualified from possessing or using firearms or ammunition in accordance with applicable State or Federal law, to include 18 U.S.C. 922. Applicants shall use information that has been obtained during the completion of the individual's background investigation for unescorted access to determine suitability. Satisfactory completion of a firearms background check for the individual under 10 CFR 73.19 of this part will also fulfill this requirement. The provisions of 10 CFR Part 73, Appendix B, Section VI.B.1(b) require the qualification of each individual to perform assigned duties and responsibilities must be documented by a qualified training instructor and attested to by a security supervisor.

Section 2.1 of the T&QP details the requirements of qualifications for employment in the security organization that follows the regulation in 10 CFR Part 73, Appendix B, Section VI.B.1(a).

Physical Qualifications

The provisions of 10 CFR Part 73, Appendix B, Section VI.B.2 require, in part, that individuals whose duties and responsibilities are directly associated with the effective implementation of the Commission-approved security plans, applicant protective strategy, and implementing procedures, may not have any physical conditions that would adversely affect their performance of assigned security duties and responsibilities.

Section 2.2 of the T&QP details those individuals that are directly associated with implementation of the security plans. Protective strategy and procedures may not have any physical conditions that would adversely affect their performance of assigned security duties and responsibilities. All individuals that are found on the critical task matrix shall demonstrate the necessary physical qualifications prior to duty.

Physical Examination

It is stated in 10 CFR Part 73, Appendix B, Section VI.B.2(a)(2), that armed and unarmed individuals assigned security duties and responsibilities shall be subject to a physical examination designed to measure the individual's physical ability to perform assigned duties and responsibilities as identified in the Commission-approved security plans, applicant protective strategy, and implementing procedures.

The provisions of 10 CFR Part 73, Appendix B, Section VI.B.2(a)(3) state, in part, that the physical examination must be administered by a licensed health professional with the final determination being made by a licensed physician to verify the individual's physical capability to perform assigned duties and responsibilities.

The provisions of 10 CFR Part 73, Appendix B, Section VI.B.2(b) through (e) provide the minimum requirements that individuals must meet, and include requirements for vision, hearing, review of existing medical conditions, and examination for potential addictions.

The provisions of 10 CFR Part 73, Appendix B, Section VI.B.2(f) address medical examinations before returning to assigned duties following any incapacitation.

Section 2.3 of the T&QP describes the physical examinations for armed and unarmed individuals assigned security duties, as well as other individuals that implement parts of the physical protection program. Minimum requirements exist for physical examinations of vision, hearing, existing medical conditions, addiction or other physical requirements.

The NRC staff has reviewed the applicant's description in T&QP Sections 2.1, 2.2, and 2.3 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73 Appendix B, Sections VI.B.1 and VI.B.2, and are, therefore, acceptable.

Medical Examinations and Physical Fitness Qualifications

The provisions of 10 CFR Part 73, Appendix B, Section VI.B.4(a) require, in part, that armed members of the security organization shall be subject to a medical examination by a licensed physician, to determine the individual's fitness to participate in physical fitness tests, and that the applicant shall obtain and retain a written certification from the licensed physician that no medical conditions were disclosed by the medical examination that would preclude the individual's ability to participate in the physical fitness tests or meet the physical fitness attributes or objectives associated with assigned duties.

The provisions of 10 CFR Part 73, Appendix B, Section VI.B.4(b) require, in part, that before assignment, armed members of the security organization shall demonstrate physical fitness for assigned duties and responsibilities by performing a practical physical fitness test. The physical fitness test must consider physical conditions such as strenuous activity, physical exertion, levels of stress, and exposure to the elements as they pertain to each individual's assigned security duties. The physical fitness qualification of each armed member of the security organization must be documented by a qualified training instructor and attested to by a security supervisor.

Section 2.4 of the T&QP is explicit in its requirements for medical examinations and physical qualifications.

The NRC staff has reviewed the applicant's description in T&QP Section 2.4 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Section VI.B.4(a) and 10 CFR Part 73, Appendix B, Section VI.B.4(b), and is, therefore, acceptable.

Psychological Qualifications

General Psychological Qualifications

The provisions of 10 CFR Part 73, Appendix B, Section VI.B.3(a) require, in part, that armed and unarmed individuals shall demonstrate the ability to apply good judgment, mental alertness, the capability to implement instructions and assigned tasks, and possess the acuity of senses and ability of expression sufficient to permit accurate communication by written, spoken, audible, visible, or other signals required by assigned duties and responsibilities.

Section 2.5.1 of the T&QP details that individuals whose security tasks and jobs directly associated with the effective implementation of the security plan and protective strategy shall demonstrate the qualities in 10 CFR Part 73, Appendix B, Section VI.B.3(a).

Professional Psychological Examination

The provisions of 10 CFR Part 73, Appendix B, Section VI.B.3(b) require, in part, that a licensed psychologist, psychiatrist, or physician trained in part to identify emotional instability shall determine whether armed members of the security organization and alarm station operators in addition to meeting the requirement stated in paragraph (a) of this section, have no emotional instability that would interfere with the effective performance of assigned duties and responsibilities.

The provisions of 10 CFR Part 73, Appendix B, Section VI.B.3(c) require that a person professionally trained to identify emotional instability shall determine whether unarmed individuals, in addition to meeting the requirement stated in

paragraph (a) of this section, have no emotional instability that would interfere with the effective performance of assigned duties and responsibilities.

Section 2.5.2 of the T&QP provides for the administration of psychological and emotional determination that will be conducted by appropriately licensed and trained individuals.

The NRC staff has reviewed the applicant's description in T&QP Sections 2.5.1 and 2.5.2 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Sections VI.B.3(a), (b) and (c), and are, therefore, acceptable.

Documentation

The provisions of 10 CFR Part 73, Appendix B, Section VI.H.1 require, in part, the retention of all reports, records, or other documentation required by Appendix B and 10 CFR 75.55(q).

Section 2.6 of the T&QP describes that qualified training instructors create the documentation of training activities and that security supervisors attest to these records as required. Records are retained in accordance with Section 22 of the PSP.

The NRC staff has reviewed the applicant's description in T&QP Section 2.6 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Section VI.H.1 and is, therefore, acceptable.

Physical Requalification

The provisions of 10 CFR Part 73, Appendix B, Section VI.B.5 require that: (a) at least annually, armed and unarmed individuals shall be required to demonstrate the capability to meet the physical requirements of this appendix and the applicant's T&QP; and (b) the physical requalification of each armed and unarmed individual must be documented by a qualified training instructor and attested to by a security supervisor.

Section 2.7 of the T&QP describes that physical requalification is conducted at least annually, and documented as described in the PSP.

The NRC staff has reviewed the applicant's description in T&QP Section 2.7 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in

the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Section VI.B.5 and is, therefore, acceptable.

13.6.4.2.3 Individual Training and Qualification

Duty Training

The provisions of 10 CFR Part 73, Appendix B, Section VI.C.1 provide for duty training and qualification requirements. The regulation states, in part, that all personnel who are assigned to perform any security-related duty or responsibility shall be trained and qualified to perform assigned duties and responsibilities to ensure that each individual possesses the minimum knowledge, skills, and abilities required to effectively carry out those assigned duties and responsibilities. These areas of training include performing assigned duties and responsibilities in accordance with the requirements of the T&QP and the PSP, and be trained and qualified in the use of all equipment or devices required to effectively perform all assigned duties and responsibilities.

Section 3.1 of the T&QP details the requirements that individuals assigned duties must be trained in their duties, meet minimum qualifications, and be trained and qualified in all equipment or devices required to perform their duties.

The NRC staff has reviewed the applicant's description in T&QP Sections 3.0 and 3.1 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Section VI.C.1, and is, therefore, acceptable.

On-the-job Training

The provisions of 10 CFR Part 73, Appendix B, Sections VI.C.2(a) through (c) provides requirements for on-the-job training. On-the-job training must include individual demonstration of the knowledge, skills and abilities provided during the training process. Individuals assigned contingency duties must complete a minimum of 40 hours of on-the-job training.

On-the-job training for contingency activities and drills must include, but is not limited to, hands-on application of knowledge, skills, and abilities related to: (1) response team duties; (2) use of force; (3) tactical movement; (4) cover and concealment; (5) defensive positions; (6) fields-of-fire; (7) re-deployment; (8) communications (primary and alternate); (9) use of assigned equipment; (10) target sets; (11) table top drills; (12) command and control duties; (13) applicant's protective strategy.

The T&QP provides a comprehensive discussion of the applicant's approach to meeting the requirements for on-the-job training.

The NRC staff has reviewed the applicant's description in T&QP Section 3.2 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Sections VI.C.2(a) through (c), and is, therefore, acceptable.

Critical Task Matrix

The provisions of 10 CFR Part 73, Appendix B, Section VI.C.2(b) require, in part, that each individual who is assigned duties and responsibilities identified in the Commission-approved security plans, licensee protective strategy, and implementing procedures shall, before assignment, demonstrate proficiencies in implementing the knowledge, skills and abilities to perform assigned duties.

The T&QP includes a critical task matrix as Table 1 of the T&QP. This matrix addresses the means through which each individual will demonstrate the required proficiencies. Tasks that individuals must perform are listed in RG 5.75.

The NRC staff has reviewed the applicant's description in T&QP Section 3.3 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Section VI.C.2(b), and is, therefore, acceptable.

Initial Training and Qualification Requirements

The provisions of 10 CFR Part 73, Appendix B, Sections VI.C.1(a) through (b) provide the requirements for duty training.

The provisions of 10 CFR Part 73, Appendix B, Section VI.D.1(a) provide the requirements for demonstration of qualification.

Section 3.4 of the T&QP details that individuals are trained and qualified prior to performing security-related duties within a security organization and must meet the minimum qualifying standards in Sections 3.4.1 and 3.4.2.

Written Examination

The provisions of 10 CFR Part 73, Appendix B, Section VI.D.1(b)(1) provide that written exams must include those elements listed in the Commission-approved T&QP to demonstrate an acceptable understanding of assigned duties and responsibilities, to include the recognition of potential tampering involving both safety and security equipment and systems.

Hands on Performance Demonstration

The provisions of 10 CFR Part 73, Appendix B, Section VI.D.1(b)(2) require that armed and unarmed individuals shall demonstrate hands-on performance for assigned duties and responsibilities by performing a practical hands-on demonstration for required tasks. The hands-on demonstration must ensure that theory and associated learning objectives for each required task are considered and each individual demonstrates the knowledge, skills, and abilities required to effectively perform the task.

Sections 3.4.1 and 3.4.2 of the T&QP describe the measures that are implemented by the applicant that meet the requirements stated above.

The NRC staff has reviewed the applicant's description in T&QP Sections 3.4, 3.4.1, and 3.4.2 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Sections VI.C.1 and D.1, and is, therefore, acceptable.

Continuing Training and Qualification

The provisions of 10 CFR Part 73, Appendix B, Section VI.D.2 state, in part, that armed and unarmed individuals shall be re-qualified at least annually in accordance with the requirements of this appendix and the Commission-approved T&QP. The results of requalification must be documented by a qualified training instructor and attested by a security supervisor.

Section 3.5 of the T&QP provides discussion regarding the management of the requalification program to ensure that each individual is trained and qualified. In part, the applicant's plan provides that annual requalification may be completed up to three (3) months before or three (3) months after the scheduled date. However, the next annual training must be scheduled (12) months from the previously scheduled date rather than the date the training was actually completed.

The NRC staff has reviewed the applicant's description in T&QP Section 3.5 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Section VI.D.2, and is, therefore, acceptable.

Annual Written Examination

The provisions of 10 CFR Part 73, Appendix B, Section VI.D.(b)(3) provide that armed individuals shall be administered an annual written exam that demonstrates the required knowledge, skills, and abilities to carry out assigned duties and responsibilities as an armed member of the security organization. The annual written exam must include those elements listed in the Commission-approved T&QP to demonstrate an acceptable understanding of assigned duties and responsibilities.

Section 3.5.1 of the T&QP provides that each individual will be tested, in part, with an annual written exam that, at a minimum, covers: the role of security personnel; use of deadly force; the requirements in 10 CFR 73.21; authority of private security personnel; power of arrest; search and seizure; offsite law enforcement response; tactics and tactical deployment and engagement.

The NRC staff has reviewed the applicant's description in T&QP Section 3.5.1 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Section VI.D.1.(3), and is, therefore, acceptable.

Demonstration of Knowledge Skills and Abilities

The provisions of 10 CFR Part 73, Appendix B, Sections VI, A., B., C., D., (A.4, B.2(c)(2), B.3(a), B.4(b)(1), B.4(b)(3), B.5(a), C.2(a), C.2(b), C.3(a), C.3(b) C.3(d), D.1(a), D.1(b)(1), D.1(b)(2), D.1(b)(3), and D.1(c) state, in part, that an individual must demonstrate required knowledge, skills and abilities, to carry out assigned duties and responsibilities.

Section 3.5.2 of the T&QP provides that all knowledge, skills and abilities will be demonstrated in accordance with a systematic approach to training (SAT) program as described in RG 5.75.

The NRC staff has reviewed the applicant's description in T&QP Section 3.5.2 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Sections VI.A, B, C, and D and is, therefore, acceptable.

Weapons Training and Qualification

General Firearms Training

The provisions of 10 CFR Part 73, Appendix B, Section VI.E provide that armed members of the security organization shall be trained and qualified in accordance with the requirements of this appendix and the Commission-approved T&QP. Training must be conducted by certified firearms instructors who shall be recertified at least every three (3) years. Applicants shall conduct annual firearms familiarization, and armed members of the security organization must participate in weapons range activities on a nominal four (4) month periodicity.

Section 3.6.1 of the T&QP addresses the requirements in 10 CFR Part 73, Appendix B, Sections VI.E.1(d)(1) through (11) and includes the requirements for training in the use of deadly force and participation in weapons range activities on a nominal four (4) month periodicity.

The NRC staff has reviewed the applicant's description in T&QP Section 3.6.1 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Section VI.E.1, and is, therefore, acceptable.

General Weapons Qualification

The provisions of 10 CFR Part 73, Appendix B, Section VI.F.1 Weapons Qualification and Requalification Program require that qualification firing must be accomplished in accordance with Commission requirements and the Commission-approved T&QP for assigned weapons. The results of weapons qualification and requalification must be documented and retained as a record.

Section 3.6.2 of the T&QP provides that all armed personnel are qualified and re-qualified with assigned weapons. All weapons qualification and re-qualification will be documented and retained as a record.

The NRC staff has reviewed the applicant's description in T&QP Section 3.6.2 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Section VI.F.1, and is, therefore, acceptable.

Tactical Weapons Qualification

The provisions of 10 CFR Part 73, Appendix B, Section VI.F.2 require that the applicant conduct tactical weapons qualification. The applicant T&QP must describe the firearms used, the firearms qualification program, and other tactical training required to implement the Commission-approved security plans, applicant protective strategy, and implementing procedures. Applicant developed tactical qualification and requalification courses must describe the performance criteria needed to include the site specific conditions (such as lighting, elevation, fields-of-fire) under which assigned personnel shall be required to carry out their assigned duties.

Section 3.6.3 of the T&QP provides that a tactical qualification course of fire is used to assess armed security force personnel in tactical situations to ensure they are able to demonstrate required tactical knowledge, skills and abilities remain proficient.

The NRC staff has reviewed the applicant's description in T&QP Section 3.6.3 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Section VI.F.2 and is, therefore, acceptable.

Firearms Qualification Courses

The provisions of 10 CFR Part 73, Appendix B, Section VI.F.3 state, in part, that the applicant shall conduct the following qualification courses for each weapon used: (a) an annual daylight fire qualification course; and (b) an annual night fire qualification course.

Courses of Fire

The provisions of 10 CFR Part 73, Appendix B, Section VI.F.4 describe required courses of fire.

Section 3.6.4 of the T&QP provides a description of the firearms qualification courses used to ensure armed members of the security organization are properly trained and qualified. Courses of fire are used individually for handguns, shotguns, and semiautomatic rifles, and enhanced weapons.

The NRC staff has reviewed the applicant's description in T&QP Section 3.6.4 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73,

Appendix B, Section VI.F.3, and 10 CFR Part 73, Appendix B, Section VI.F.4, and is, therefore, acceptable.

Firearms Requalification

The provisions of 10 CFR Part 73, Appendix B, Section VI.F.5 provide that armed members of the security organization shall be re-qualified for each assigned weapon at least annually in accordance with Commission requirements and the Commission-approved T&QP, and the results documented and retained as a record. Firearms requalification must be conducted using the courses of fire outlined in 10 CFR Part 73, Appendix B, Sections VI.F.2, VI.F.3, and VI.F.4.

Section 3.6.5 of the T&QP describes that armed members of the security organization re-qualify at least annually with each weapon assigned, using the courses of fire provided in the T&QP.

The NRC staff has reviewed the applicant's description in T&QP Section 3.6.5 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Section VI.F.5, and is, therefore, acceptable.

Weapons, Personal Equipment and Maintenance

The provisions of 10 CFR Part 73, Appendix B, Section VI.G provide the requirements for the maintenance of weapons and personal equipment. These requirements provide that the applicant shall provide armed personnel with weapons that are capable of performing the function stated in the Commission-approved security plans, applicant protective strategy, and implementing procedures. In addition, the applicant shall ensure that each individual is equipped or has ready access to all personal equipment or devices required for the effective implementation of the Commission-approved security plans, applicant protective strategy, and implementing procedures.

Section 3.7 of the T&QP describes that personnel are provided with weapons and personal equipment necessary to meet the plans and the protective strategy. The equipment provided is described in Section 9.0 of the PSP, and maintenance is performed as described in Section 20.0 of the PSP.

The NRC staff has reviewed the applicant's description in T&QP Section 3.7 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Section VI.G, and is, therefore, acceptable. The staff's review of Sections 9.0 and 20.0 of the PSP is in Section 13.6.4.1.9 and 13.6.4.1.20 of this SER.

Documentation

The provisions of 10 CFR Part 73, Appendix B, Section VI.H require that the applicant shall retain all reports, records, or other documentation required by this appendix in accordance with the requirements of 10 CFR 73.55(r). The applicant shall retain each individual's initial qualification record for three (3) years after termination of the individual's employment and shall

retain each re-qualification record for three (3) years after it is superseded. The applicant shall document data and test results from each individual's suitability, physical, and psychological qualification and shall retain this documentation as a record for three (3) years from the date of obtaining and recording these results.

Section 3.8 of the T&QP provides that records are retained in accordance with Section 22 of the PSP.

The NRC staff has reviewed the applicant's description in T&QP Section 3.8 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Section VI.H and is, therefore, acceptable.

The following portion of this technical evaluation section is reproduced from Section 13.6.4.2 of the VEGP SER:

> *13.6.4.2.4 Performance Evaluation Program*
>
> *10 CFR Part 73, Appendix B, Section VI.C.3, Performance Evaluation Program*
>
> *(a) Applicants shall develop, implement and maintain a performance evaluation program that is documented in procedures, which describes how the applicant will demonstrate and assess the effectiveness of their onsite physical protection program and protective strategy, including the capability of the armed response team to carry out their assigned duties and responsibilities during safeguards contingency events. The performance evaluation program and procedures shall be referenced in the applicant's T&QP.*
>
> *(b) The performance evaluation program shall include procedures for the conduct of tactical response drills and force-on-force exercises designed to demonstrate and assess the effectiveness of the applicant's physical protection program, protective strategy and contingency event response by all individuals with responsibilities for implementing the SCP. The performance evaluation program must be designed to ensure, in part, that each member of each shift who is assigned duties and responsibilities required to implement the SCP and applicant protective strategy participates in at least one tactical response drill on a quarterly basis and one force-on-force exercise on an annual basis.*
>
> *Section 4 of the T&QP details the performance evaluation program consistent with the requirements of 10 CFR Part 73, Appendix B, Sections VI.C.3(a) through (m). Additional details of the performance evaluation program are described in the facility procedures.*
>
> *The NRC staff has reviewed the applicant's description in T&QP Section 4 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in*

the T&QP meets the requirements of 10 CFR Part 73, Appendix B, Section VI.C.3 and is, therefore, acceptable.

13.6.4.2.5 Definitions

The provisions of 10 CFR Part 73, Appendix B, Section VI.J state, in part, that terms defined in 10 CFR Part 50, 10 CFR Part 70, and 10 CFR Part 73 have the same meaning when used in this appendix. Definitions are found in the PSP, Appendix A, "Glossary of Terms and Acronyms." [On the basis of its review, the NRC staff finds that the definitions sections of the PSP meet the requirements of 10 CFR 73.2, and are, therefore, acceptable.]

Included in this section of the T&QP is the Critical Task Matrix, which is considered SGI and has not been included in this SER.

The NRC staff has reviewed the applicant's description in T&QP of the Critical Task Matrix tasks for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the T&QP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the T&QP meets the requirements of 10 CFR Part 73, Appendix B, and are, therefore, acceptable.

13.6.4.2.6 Conclusion on the Training and Qualification Plan

On the basis of the NRC staff's review described in Sections 13.6.4.2.1 through 13.6.4.2.5 of this SER, the T&QP meets the requirements of 10 CFR Part 73, Appendix B. The target sets, Target Set Analysis and Site Protective Strategy are in the facility implementing procedures, which were not subject to NRC staff review as part of this COL application and are, therefore, subject to future NRC inspection in accordance with 10 CFR 73.55(c)(7)(iv) and 10 CFR Part 73, Appendix C, Section II.B.5(iii). The NRC staff concludes that complete and procedurally correct implementation will provide high assurance that activities involving special nuclear material are not inimical to the common defense and security and do not constitute an unreasonable risk to the public health and safety.

13.6.4.3 <u>Appendix C Safeguards Contingency Plan</u>

13.6.4.3.1 Background Information

This category of information identifies the perceived dangers and incidents that the plan addresses and a general description of how the response is organized.

<u>Purpose of the Safeguards Contingency Plan</u>

The provisions of 10 CFR Part 73, Appendix C, Section II.B.1.b state that the applicant should discuss general goals, objectives and operational concepts underlying the implementation of the SCP.

Section 1.1 of the SCP describes the purpose and goals of the SCP, including guidance to security and management for contingency events.

Scope of the Safeguards Contingency Plan

The provisions of 10 CFR Part 73, Appendix C, Section II.B.1.c delineate the types of incidents that should be covered by the applicant in the SCP, how the onsite response effort is organized and coordinated to effectively respond to a safeguards contingency event and how the onsite response for safeguards contingency events has been integrated into other site emergency response procedures.

Section 1.2 of the SCP details the scope of the SCP to analyze and define decisions and actions of security force personnel, as well as facility operations personnel, for achieving and maintaining safe shutdown.

Perceived Danger

The provisions of 10 CFR Part 73, Appendix C, Section II.B.1a require that, consistent with the DBT specified in 10 CFR 73.1(a)(1), the applicant shall identify and describe the perceived dangers, threats, and incidents against which the SCP is designed to protect.

Section 1.3 of the SCP outlines the threats used to design the physical protection systems.

The applicant adequately addresses perceived danger, provides a purpose of the plan, and describes the scope of the plan.

Definitions

Section 1.4 of the SCP describes that a list of terms and their definitions used in describing operational and technical aspects of the approved SCP as required by 10 CFR Part 73, Appendix C, Section II.B.1.d is found in Appendix A of the PSP.

The NRC staff has reviewed the applicant's description in SCP Sections 1, 1.1, 1.2, 1.3, and 1.4 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the SCP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the SCP meets the requirements of 10 CFR Part 73, Appendix C, Section II.B.3 and are, therefore, acceptable.

13.6.4.3.2 Generic Planning Base

As required in 10 CFR Part 73, Appendix C, Section II.B.2, this section of the plan defines the criteria for initiation and termination of responses to security events, to include the specific decisions, actions, and supporting information needed to respond to each type of incident covered by the approved SCP.

Situations Not Covered by the Contingency Plan

Section 2.1 of the SCP details the general types of conditions that are not covered in the plan.

Situations Covered by the Contingency Plan

The provisions of 10 CFR Part 73, Appendix C, Section II.B.2.a require, in part, that the plan identify those events that will be used for signaling the beginning or aggravation of a safeguards contingency according to how they are perceived initially by the applicant's personnel. Applicants shall ensure detection of unauthorized activities and shall respond to all alarms or other indications signaling a security event, such as penetration of a PA, vital area, or unauthorized barrier penetration (vehicle or personnel); tampering, bomb threats, or other threat warnings—either verbal, such as telephoned threats, or implied, such as escalating civil disturbances.

The provisions of 10 CFR Part 73, Appendix C, Section II.B.2.b require, in part, that the plan define the specific objective to be accomplished relative to each identified safeguards contingency event. The objective may be to obtain a level of awareness about the nature and severity of the safeguards contingency to prepare for further responses; to establish a level of response preparedness; or to successfully nullify or reduce any adverse safeguards consequences arising from the contingency.

The provisions of 10 CFR Part 73, Appendix C, Section II.B.2.c require, in part, that the applicant identify the data, criteria, procedures, mechanisms and logistical support necessary to achieve the objectives identified.

Section 2.2 of the SCP describes in detail the specific situations covered by the SCP, including objectives and information required for each.

The NRC staff has reviewed the applicant's description in SCP Sections 2, 2.1 and 2.2 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the SCP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the SCP meets the requirements of 10 CFR Part 73, Appendix C Section II.B.2 and are, therefore, acceptable.

13.6.4.3.3 Responsibility Matrix

The provisions of 10 CFR Part 73, Appendix C, Section II.B.4 state that this category of information consists of the detailed identification of responsibilities and specific actions to be taken by the applicant's organizations and/or personnel in response to safeguards contingency events. To achieve this result the applicant must address the following.

The provisions of 10 CFR Part 73, Appendix C, Section II.B.4.a require, in part, that the applicant develop site procedures that consist of matrixes detailing the organization and/or personnel responsible for decisions and actions associated with specific responses to

safeguards contingency events. The responsibility matrix and procedures must be referenced in the applicant's SCP.

The provisions of 10 CFR Part 73, Appendix C, Section II.B.4.b require, in part, that the responsibility matrix procedures shall be based on the events outlined in the applicant's generic planning base and include specific objectives to be accomplished, description of responsibilities for decisions and actions for each event, and overall description of response actions each responding entity.

The provisions of 10 CFR Part 73, Appendix C, Section II.B.4.c require, in part, that responsibilities are to be assigned in a manner that precludes conflict of duties and responsibilities that would prevent the execution of the SCP and emergency response plans.

The provisions of 10 CFR Part 73, Appendix C, Section II.B.4.d require, in part, that the applicant ensure that predetermined actions can be completed under the postulated conditions.

Section 3 of the SCP includes the responsibility matrix. The responsibility matrix integrates the response capabilities of the security organization (described in Section 4 of the SCP) with the background information relating to decision/actions and organizational structure (described in Section 1 of the SCP). The responsibility matrix provides an overall description of the response actions and their interrelationships. Responsibilities and actions have been predetermined to the maximum extent possible and assigned to specific entities to preclude conflicts that would interfere with or prevent the implementation of the SCP or the ability to protect against the DBT of radiological sabotage.

The NRC staff has reviewed the applicant's description in SCP Section 3 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the SCP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the SCP meets the requirements of 10 CFR Part 73, Appendix C, Section II.B.4 and is, therefore, acceptable.

13.6.4.3.4 Licensee Planning Base

The provisions of 10 CFR Part 73, Appendix C, Section II.B.3 require, in part, that the applicant planning base include factors affecting the SCP specific for each facility.

Licensee Organization

The provisions of 10 CFR Part 73, Appendix C, Section II.B.3.a require in part, that the SCP describe the organization's chain of command and delegation of authority during safeguards contingency events, to include a general description of how command and control functions will be coordinated and maintained.

Duties/Communication Protocols

Section 4.1.1 of the SCP details the duties and communications protocols of each member of the security organization responsible for implementing any portion of the applicant's protective strategy.

Security Chain of Command/Delegation of Authority

Section 4.1.2 of the SCP details the chain of command and delegation of authority during normal operations is discussed in the PSP. The chain of command and delegation of authority during contingency events is also described in the responsibility matrix portions of the SCP. The chain of command and delegation of authority during normal operations is discussed in the PSP.

Physical Layout

The provisions of 10 CFR Part 73, Appendix C, Section II.B.3(b) require, in part, that the SCP include a site map depicting the physical structures located on the site, including onsite independent spent fuel storage installations, and a description of the structures depicted on the map. Plans must also include a description and map of the site in relation to nearby towns, transportation routes (e.g., rail, water, and roads), pipelines, airports, hazardous material facilities, and pertinent environmental features that may have an effect upon coordination of response activities. Descriptions and maps must indicate main and alternate entry routes for law enforcement or other offsite response and support agencies and the location for marshaling and coordinating response activities.

Section 4.2 of the SCP references Section 1.1 of the PSP for layouts of the OCA, PA, vital areas, site maps, and descriptions of site features.

Safeguards Systems

The provisions of 10 CFR Part 73, Appendix C, Section II.B.3.c require, in part, that the SCP include a description of the physical security systems that support and influence how the applicant will respond to an event in accordance with the DBT described in 10 CFR 73.1(a). The description must begin with onsite physical protection measures implemented at the outermost perimeter, and must move inward through those measures implemented to protect target set equipment.

Section 4.3 of the PSP describes that safeguards systems are described in PSP Sections 9, 11, 12, 13, 15 and 16, and in facility implementing procedures/documents. Section 8 of the SCP describes how physical security systems will be used to respond to a threat at the site.

Law Enforcement Assistance

The provisions of 10 CFR Part 73, Appendix C, Section II.B.3.d require in part, that the applicant provide a listing of available law enforcement agencies and a general description of their response capabilities and their criteria for response and a discussion of working agreements or arrangements for communicating with these agencies.

Section 4.4 of the SCP details the role of LLEA in the site protective strategy. Additional details regarding LLEA are included in Section 8 of the PSP and Section 5.6 of the SCP.

Policy Constraints and Assumptions

The provisions of 10 CFR Part 73, Appendix C, Section II.B.3.e require in part, that the SCP include a discussion of State laws, local ordinances, and company policies and practices that govern applicant response to incidents and must include, but is not limited to, the following:

1) use of deadly force; 2) recall of off-duty employees; 3) site jurisdictional boundaries; and 4) use of enhanced weapons, if applicable.

Section 4.5 of the SCP details the site security policies, including the use of deadly force and authority to request offsite assistance.

Administrative and Logistical Considerations

The provisions of 10 CFR Part 73, Appendix C, Section II.B.3.f require in part, that the applicant provide descriptions of applicant practices, which influence how the security organization responds to a safeguards contingency event to include, but is not limited to, a description of the procedures that will be used for ensuring that equipment needed to facilitate response will be readily accessible, in good working order, and in sufficient supply.

Section 4.6 of the SCP outlines administrative duties of the Security Manager, Security Shift Team Leader, facility procedures and administrative forms.

The NRC staff has reviewed the applicant's description in SCP Sections 4, 4.1, 4.1.1, 4.1.2, and 4.2 through 4.6 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the SCP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the SCP meets the requirements of 10 CFR Part 73, Appendix C, Section II.B.3 and is, therefore, acceptable.

13.6.4.3.5 Response Capabilities

This section outlines the response by the applicant to threats to the facility. The applicant details how they protect against the DBT with onsite and offsite organizations, consistent with the regulation of 10 CFR 50.54(p)(1) and (hh), 10 CFR 73.55(k), 10 CFR Part 73, Appendix B, Section VI and 10 CFR Part 73, Appendix C, Section II.B.3. In addition, 10 CFR Part 73, Appendix C, "Introduction," states, in part, it is important to note that a applicant's SCP is intended to be complementary to any emergency plans developed pursuant to Appendix E to 10 CFR Part 50 and 10 CFR 52.17.

Response to Threats

Section 5.1 of the SCP describes how the protective strategy is designed to defend the facility against all aspects of the DBT. Each organization has defined roles and responsibilities.

Armed Response Team

Section 5.2 of the SCP notes individuals from the Responsibility Matrix and their role in the site protective strategy. This section also notes the minimum number of individuals and their contingency equipment for implementation of the protective strategy. The applicant described the armed response team consistent with 10 CFR 73.55(k)(4), (5), (6), and (7), 10 CFR Part 73, Appendix B, Section VI, and 10 CFR Part 73, Appendix C, Section II.B.3.

Supplemental Security Officer

Section 5.3 of the SCP details the role of supplemental security officers in the site protective strategy. The applicant described the use of supplemental security officers, consistent with the requirements in 10 CFR 73.55(k)(4).

Facility Operations Response

Section 5.4 of the SCP details the role of operations personnel in the site protective strategy, including responsibilities, strategies, and conditions for operator actions as discussed in 10 CFR 50.54(hh).

Emergency Plan Response

Section 5.5 of the SCP notes the integration of the Emergency Plan with the site's protective strategy, and gives some examples of how the Emergency Plan can influence the protective strategy as discussed in 10 CFR 73.55(b)(11).

Local Law Enforcement Agencies (LLEA)

Section 5.6 of the SCP meets the requirements of 10 CFR 73.55(k)(9) and 10 CFR Part 73, Appendix C, Section II.B.3.d and lists the LLEAs that will respond to the site as a part of the protective strategy. Details on the response of the LLEA are located in Section 8 of the PSP.

State Response Agencies

Section 5.7 of the SCP meets the requirements of 10 CFR 73.55(k)(9) and 10 CFR Part 73, Appendix C, Section II.B.3.d and lists the State response agencies that will respond to the site as a part of the protective strategy.

Federal Response Agencies

Section 5.8 of the SCP meets the requirements of 10 CFR 73.55(k)(9) and 10 CFR Part 73, Appendix C, Section II.B.3.d and lists the Federal response agencies that will respond to the site as a part of the protective strategy.

Response to ISFSI Events

VCSNS Units 2 and 3 do not have an ISFSI, so this section does not apply.

The NRC staff has reviewed the applicant's description in SCP Sections 5.0 through 5.9 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the SCP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the SCP meets the requirements of 10 CFR 50.54(p)(1) and (hh), 10 CFR 73.55(k), 10 CFR Part 73, Appendix B, Section VI and 10 CFR Part 73, Appendix C, Section II.B.3 and is, therefore, acceptable. In addition, Appendix C, "Introduction" states, in part, that it is important to note that an applicant's SCP is intended to be complementary to any emergency plans developed pursuant to Appendix E to 10 CFR Part 50 and 10 CFR 52.17.

The following portion of this technical evaluation section is reproduced from Section 13.6.4.3 of the VEGP SER:

> *13.6.4.3.6 Defense-In-Depth*
>
> *Section 6 of the SCP lists site physical security characteristics, programs, and the strategy elements that illustrate the defense-in-depth nature of the site protective strategy as required in 10 CFR 73.55(b)(3).*
>
> *The NRC staff has reviewed the applicant's description in SCP Section 6 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the SCP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the SCP meets the requirements of 10 CFR 73.55(b)(3) and is, therefore, acceptable.*
>
> *13.6.4.3.7 Primary Security Functions*
>
> *Section 7 of the SCP details the primary security functions of the site, and their roles in the site protective strategy. It also notes the development of target sets, and their function in the development of the site's protective strategy.*
>
> *The NRC staff has reviewed the applicant's description in SCP Section 7 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the SCP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the SCP meets the requirements of 10 CFR 10 CFR 73.55(b) and is, therefore, acceptable.*

13.6.4.3.8 Protective Strategy

The provisions of 10 CFR Part 73, Appendix C, Section II.B.3.c(v) require that applicants develop, implement and maintain a written protective strategy that shall: 1) be designed to meet the performance objectives of 10 CFR 73.55(a) through (k); 2) identify predetermined actions, areas of responsibilities, and timelines for the deployment of armed personnel; 3) include measures that limit the exposure of security personnel to possible attack; 4) include a description of the physical security systems and measures that provide defense-in-depth; 5) describe the specific structure and responsibilities of the armed response organization; and 6) provide a command and control structure.

Section 8 of the SCP describes the site protective strategy.

The NRC staff has reviewed the applicant's description in SCP Section 8 for the implementation of the site-specific physical protection program in accordance with Commission regulations and NUREG-0800 acceptance criteria. Because the applicant's description in the SCP is consistent with the acceptance criteria in NUREG-0800, Section 13.6.1, the staff finds that the description provided in the SCP meets the requirements of 10 CFR Part 73, Appendix C, Section II.B.3.c(v) and is, therefore, acceptable.

The following portion of this technical evaluation section is reproduced from Section 13.6.4.3 of the VEGP SER:

> *13.6.4.3.9 Conclusions on the Safeguards Contingency Plan*
>
> *On the basis of the NRC staff's review described in Sections 13.6.4.3.1 through 13.6.4.3.8 of this SER, the SCP meets the requirements of 10 CFR Part 73, Appendix C, in accordance with the DBT of radiological sabotage as stated in 10 CFR 73.1. The target sets, Target Set Analysis and Site Protective Strategy are in the facility implementing procedures, which were not subject to NRC staff review as part of this COL application and are, therefore, subject to future NRC inspection in accordance with 10 CFR 73.55(c)(7)(iv) and 10 CFR Part 73, Appendix C, Section II.B.5(iii). The NRC staff concludes that complete and procedurally correct implementation of the SCP will provide high assurance that activities involving special nuclear material are not inimical to the common defense and security and do not constitute an unreasonable risk to the public health and safety.*

13.6.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff finds the following license condition proposed by the applicant acceptable:

- License Condition (13-5) - No later than 12 months after issuance of the COL, the licensee shall submit to the Director of NRO, a schedule that supports planning for and conduct of NRC inspection of the physical security programs. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the physical security program has been fully implemented.

13.6.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to physical security, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable based on the applicable regulations specified in Section 13.6.4 of this SER. The staff based its conclusion on the following:

- STD COL 13.6-1, as related to the physical protection program, is acceptable based on the following discussion. The NRC staff's review of the VCSNS Units 2 and 3 PSP, T&QP, and SCP has focused on ensuring the necessary programmatic elements are included in these plans to provide high assurance that activities involving special nuclear material are not inimical to the common defense and security and do not constitute an unreasonable risk to the public health and safety.

  The NRC staff has determined that these plans include the necessary programmatic elements that, when effectively implemented, will provide the required high assurance.

The burden to effectively implement these plans remains with the applicant. Effective implementation is dependent on the procedures and practices the applicant develops to satisfy the programmatic elements of its PSP, T&QP, and SCP. The NRC staff has not reviewed the site-specific target set analysis, site protective strategy and the facility implementing procedures. The target set analysis, site protective strategy and the facility implementing procedures are subject to future NRC inspections and review. As required by Section 3 of the applicant's PSP, a performance evaluation program will be implemented that periodically tests and evaluates the effectiveness of the overall protective strategy. This program requires that deficiencies be corrected. In addition, NRC inspectors will conduct periodic force-on-force exercises that will test the effectiveness of the applicant's protective strategy. Based on the results of the applicant's own testing and evaluation, the NRC's baseline inspections and force-on-force exercises, enhancements to the applicant's PSP, T&QP, and SCP may be required to ensure the overall protective strategy can be effectively implemented. As such, staff approval of the applicant's PSP, T&QP, and SCP is limited to the programmatic elements necessary to provide the required high assurance as stated above. Should deficiencies be identified with the programmatic elements of these plans as a result of the periodic applicant or NRC conducted drills or exercises that test the effectiveness of the overall protective strategy, the plans shall be corrected to address these deficiencies in a timely manner and to notify the NRC of these plan changes in accordance with the requirements of 10 CFR 50.54(p) or 10 CFR 50.90.

The COL applicant's security plan information is withheld from public disclosure in accordance with the provisions of 10 CFR 73.21.

13.6.A Site-Specific ITAAC for Physical Security

13.6.A.1 *Introduction*

Part 10, "Proposed License Conditions and ITAAC," Appendix B, "Inspections, Tests, Analysis, and Acceptance Criteria" of the VCSNS COL application describes the license conditions for the plant's physical protection systems or features to provide physical protection of the site specific protective strategy and elements of a site security program. The COL application incorporates by reference the Tier 1 Section 2.6.9 of the AP1000 DCD, including plant layout and configurations of barriers, and lists ITAAC related to the site-specific design for achieving detection, assessment, communications, delay, and response for physical protection against potential acts of radiological sabotage and theft of special nuclear material.

The design bases or supporting security analyses and assumptions related to the design descriptions of security-related features incorporated by reference from the AP1000 DCD are in TR-94, APP-GW-GLR-066. Descriptions of site-specific security structures, programs and contingency measures are in the VCSNS PSP, which includes the site PSP, T&QP and the SCP.

13.6.A.2 *Summary of Application*

Section 14.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 14.3 of the AP1000 DCD, Revision 19. Part 10, Revision 5 of the VCSNS COL application incorporates by reference DCD Tier 1 Section 2.6.9, which includes the physical security ITAAC that are in the scope of the AP1000 standard design. Site-specific physical security-ITAAC (PS-ITAAC)

that are outside the scope of AP1000 DCD Tier 1 Section 2.6.9 are provided in Table 2.6.9-2 of Appendix B to Part 10 of the VCSNS COL application.

In addition, in VCSNS COL FSAR Section 14.3, the applicant provided the following:

Supplemental Information

- STD SUP 14.3-1

The applicant provided supplemental information related to physical security in STD SUP 14.3-1 in VCSNS COL FSAR Section 14.3.2.3.2.

License Condition

- Part 10, License Condition 1

The applicant provided a license condition in Part 10 of the VCSNS COL application, Revision 2, which will incorporate the ITAAC identified in the tables in Appendix B. The staff evaluates this license condition in Chapter 1 of this SER.

13.6.A.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations are given in 10 CFR Part 73. The regulation includes specific security and performance requirements that, when adequately implemented, are designed to protect nuclear power reactors against acts of radiological sabotage, prevent the theft or diversion of special nuclear material, and protect safeguards information against unauthorized release.

The provisions of 10 CFR 52.80, Subpart A require that information submitted for a COL include the proposed ITAAC that the licensee shall perform, and the acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, analyses, and acceptance criteria are met, the facility has been constructed and will operate in conformity with the COL, the provisions of the Atomic Energy Act, and the NRC's regulations.

The VCSNS Units 2 and 3 design descriptions, commitments, and acceptance criteria for the security features, including the plant's layout and determination of vital equipment and areas, for a certified design are based on physical protection systems or hardware provided for meeting requirements of the following Commission regulations:

- 10 CFR Part 50, "Domestic licensing of production and utilization facilities"
- 10 CFR Part 52, "Licenses, certifications, and approvals for nuclear power plants"
- 10 CFR 73.1(a)(1), "Radiological sabotage"
- 10 CFR 73.55, "Requirements for physical protection of licensed activities in nuclear power reactors against radiological sabotage," and Appendices B, C, G and H

- 10 CFR Part 74, “Material control and accounting of special nuclear material”

- 10 CFR 100.21(f), “Non-seismic siting criteria”

Regulatory requirements and acceptance criteria related to physical protection systems or hardware are identified in Section 14.3.12 of NUREG-0800.

Regulatory guidance documents that are applicable to this evaluation are:

- RG 1.91, “Evaluations of Explosions Postulated to Occur at Transportation Routes Near Nuclear Power Plants,” Revision 1

- RG 1.206, “Combined License Applications for Nuclear Power Plants”

- RG 4.7, “General Site Suitability Criteria for Nuclear Power Stations,” Revision 2

- RG 5.12, “General Use of Locks in the Protection and Control of Facilities and Special Nuclear Materials”

- RG 5.62, “Reporting of Safeguards Events,” Revision 1

- RG 5.65, “Vital Area Access Controls, Protection of Physical Security Equipment and Key and Lock Controls”

- RG 5.66, “Access Authorization Program for Nuclear Power Plants”

- RG 5.7, “Entry/Exit Control for Protected Areas, Vital Areas, and Material Access Areas,” Revision 1

- RG 5.44, “Perimeter Intrusion Alarm Systems,” Revision 3

- Information Notice 86-83, “Underground Pathways into Protected Areas, Vital Areas, and Controlled Access Areas,” September 19, 1986.

- Regulatory Information Summary (RIS) 2005-04, “Guidance on the Protection of Unattended Openings that Intersect a Security Boundary or Area,” April 14, 2005. (Exempt from public disclosure in accordance with 10 CFR 2.390)

The COL applicant is required to describe commitments for establishing and maintaining a physical protection system (engineered and administrative controls), organization, programs, and procedures for implementing a site-specific strategy that, if adequately implemented, provide high assurance for protection of the plant against the DBT. The site-specific physical protection system described must be reliable and available and implement the concept of defense-in-depth protection in order to provide a high assurance of protection. The security operational programs and the physical protection system are required to meet the specific performance requirements of 10 CFR Part 26; 10 CFR 73.54; 10 CFR 73.55; 10 CFR 73.56; 10 CFR 73.57, “Requirements for criminal history records checks of individuals granted unescorted access to a nuclear power facility or access to Safeguards Information”; and

10 CFR 73.58. Physical protection hardware within the scope of the AP1000 design is addressed in the AP1000 DCD.

13.6.A.4 *Technical Evaluation*

The NRC staff reviewed Section 14.3 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to ITAAC for physical security. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. The staff confirmed that the July 1, 2010, VCSNS letter contained the same technical information provided in the June 11, 2010, VEGP letter discussed in the standard content material below.

The following portion of this technical evaluation section is reproduced from Section 13.6.A.4 of the VEGP SER:

Supplemental Information

- *STD SUP 14.3-1*

STD SUP 14.3-1 adds the following after DCD Section 14.3.2.2 as new Section 14.3.2.3.2:

> *Generic PS-ITAAC have been developed in a coordinated effort between the NRC and the Nuclear Energy Institute (NEI) as outlined in Appendix C.II.I-C of Regulatory Guide 1.206. These generic ITAAC have been tailored to the AP1000 design and site-specific security requirements.*

In Part 10, Appendix B of the VEGP Units 3 and 4 COL application, SNC describes the ITAAC for the plant's physical protection systems or features to provide physical protection of the site-specific protective strategy and elements of a site security program. The COL application incorporates by reference Tier 1 Section 2.6.9 of the AP1000 DCD, including plant layout and configurations of barriers, and listed ITAAC related to the site-specific design for achieving detection, assessment, communications, delay, and response for physical protection against potential acts of radiological sabotage and theft of special nuclear material. DCD Tier 1 Section 2.6.9 includes the physical security ITAAC that are in the scope of the AP1000 standard design. Site-specific physical security ITAAC that are outside the scope of AP1000 DCD Tier 1 Section 2.6.9 are provided in Table 2.6.9-2 of Appendix B to Part 10 of the VEGP COL application.

The NRC staff's evaluation of the PS-ITAAC (STD SUP 14.2-1) is documented in the Sections 13.6.A.4.1 through 13.6.A.4.3 of this SER.

13.6.A.4.1 Detection and Assessment Hardware

The applicant submitted the following ITAAC for detection and assessment hardware in their letter dated June 11, 2010, "Response to Request for Additional Information Letter No. 047, Supplement 2, Physical Security Inspections, Tests, Analyses, and Acceptance Criteria," This letter was used to complete the evaluation below.

1. *The external walls, doors, ceiling, and floors in the location within which the last access control function for access to the protected area is performed are bullet resistant to at least Underwriters Laboratory Ballistic Standard 752, Level 4. (Item 6 in Appendix A to Section 14.3.12 of NUREG-0800.)*

2. *Physical barriers for the protected area perimeter are not part of vital area barriers. (Item 2.a in Appendix A to Section 14.3.12 of NUREG-0800.)*

3.
   a) *Isolation zones exist in outdoor areas adjacent to the physical barrier at the perimeter of the protected area that allows 20 feet of observation on either side of the barrier. (Item 3.a in Appendix A to Section 14.3.12 of NUREG-0800.)*

   b) *Where permanent buildings do not allow a 20-foot observation distance on the inside of the protected area, the building walls are immediately adjacent to, or an integral part of, the protected area barrier. (Item 3.c in Appendix A to Section 14.3.12 of NUREG-0800.) The isolation zones are monitored with intrusion detection equipment that provides the capability to detect and assess unauthorized persons. (Item 3.b in Appendix A to Section 14.3.12 of NUREG-0800.)*

4. *The intrusion detection and assessment equipment at the protected area perimeter:*

   a) *Detects penetration or attempted penetration of the protected area barrier and concurrently alarms in both the Central Alarm Station and Secondary Alarm Station. (Item 4.a in Appendix A to Section 14.3.12 of NUREG-0800.)*

   b) *The intrusion detection and assessment equipment at the protected area perimeter remains operable from an uninterruptible power supply in the event of the loss of normal power. (Item 4.c in Appendix A to Section 14.3.12 of NUREG-0800.)*

6. *An access control system with numbered picture badges is installed for use by individuals who are authorized access to protected areas without escort. (Item 9 in Appendix A to Section 14.3.12 of NUREG-0800.)*

8.

   a) *Penetrations through the protected area barrier are secured and monitored. (Item 2.b in Appendix A to Section 14.3.12 of NUREG-0800.)*

   b) *Unattended openings (such as underground pathways) that intersect the protected area boundary or vital area boundary will be protected by a physical barrier and monitored by intrusion detection equipment or provided surveillance at a frequency sufficient to detect exploitation. (Item 2.c in Appendix A to Section 14.3.12 of NUREG-0800.)*

On the basis of its review the NRC staff determined that the applicant has adequately revised Table 2.6.9-2 for Part 10 to the VEGP COL application PS-ITAAC items 2(a), 2(b), 2 (c), 3(a), 3(b), 3(c), 4(a), 4(c), 6(partially), and 9 identified in Appendix A to Section 14.3.12 of NUREG-0800.

The VEGP COL application references the AP1000 DCD, which addressed NUREG-0800, Section 14.3.12 PS-ITAAC 4(b), 5, 6(partially), 10, 11(a), 11(b), 11(c) and 14. The staff has determined that PS-ITAAC 6, described in NUREG-0800, Section 14.3.12 has been fully addressed between the VEGP submission and the AP1000 DCD.

In a supplemental response to RAI 14.3.12-1, the applicant stated:

The information contained in SRP ITAAC number 11(d) is redundant to existing ITAAC in the AP1000 Design Certification Document (DCD). AP1000 DCD security ITAAC numbers 1, 4, 5(a), 5(b), 5(c), 13(a), 13(b), 13(c), and 15(b) demonstrate that the central and secondary alarm stations are equal and redundant, by being constructed, located, protected, and equipped to the standards for the central alarm station.

In RAI SRP 14.3.12-NSIR-7, Revision 1, Westinghouse stated:

No corresponding ITAAC has been provided for SRP 14.3.12 ITAAC number 11(d). The information contained in SRP ITAAC number 11(d) is redundant to existing ITAACs. AP1000 security ITAAC numbers 1, 4, 5(a), 5(b), 5(c), 13, and 15(b) demonstrate that the central and secondary alarm stations are constructed, located, protected, and equipped to the standards for the central alarm station.

On the basis of its review, the NRC staff determined that the applicant has adequately shown that NUREG-0800, Section 14.3.12 detection and assessment hardware ITAAC 11(d) is addressed.

13.6.A.4.2 Delay or Barrier Design

The applicant submitted the following ITAAC for Delay or Barrier Design in their "Response to Request for Additional Information Letter No. 047, Supplement 2, Physical Security Inspections, Tests, Analyses, and Acceptance Criteria," dated June 11, 2010. This letter was used to complete the evaluation below.

5. *Access control points are established to:*

    a) *Control personnel and vehicle access into the protected area. (Item 8.a in Appendix A to Section 14.3.12 of NUREG-0800.)*

    b) *Detect firearms, explosives, and incendiary devices at the protected area personnel access points. (Item 8.b in Appendix A to Section 14.3.12 of NUREG-0800.)*

7. *Access to vital equipment physical barriers requires passage through the protected area perimeter barrier. (Item 1.b in Appendix A to Section 14.3.12 of NUREG-0800.)*

On the basis of its review, the NRC staff determined that the applicant has adequately addressed NUREG-0800, Section 14.3.12 delay or barrier design PS-ITAAC 1(b)(partially),8(a) and 8(b).

The VEGP COL application references the AP1000 DCD, which addressed NUREG-0800, Section 14.3.12 PS-ITAAC 1(a), 1(b)(partially), 7, 13(a) and 13(b). The staff has determined that PS-ITAAC 1(b) described in NUREG-0800, Section 14.3.12 has been fully addressed between the VEGP submission and the AP1000 DCD.

13.6.A.4.3 Systems, Hardware, or Features Facilitating Security Response and Neutralization

The applicant submitted the following ITAAC for Systems, Hardware, or Features Facilitating Security Response and Neutralization in their "Response to Request for Additional Information Letter No. 047, Supplement 2, Physical Security Inspections, Tests, Analyses, and Acceptance Criteria," Dated June 11, 2010. This letter was used to complete the evaluation below.

9. *Emergency exits through the protected area perimeter are alarmed and secured with locking devices to allow for emergency egress. (Item 15 in Appendix A to Section 14.3.12 of NUREG-0800.)*

On the basis of its review, the NRC staff determined that the applicant has adequately addressed NUREG-0800, Section 14.3.12 delay or barrier design PS-ITAAC 15(partially).

The VEGP COL application references the AP1000 DCD, which addressed NUREG-0800, Section 14.3.12 PS-ITAAC 12, 15(partially) 16(a), 16(b) and 16(c). The staff has determined that PS-ITAAC 15 described in NUREG-0800, Section 14.3.12 has been fully addressed between the VEGP submission and the AP1000 DCD.

13.6.A.5 *Post-Combined License Activities*

For the reasons discussed in the technical evaluation section above, the staff proposes to include the following ITAAC for physical security:

- The licensee shall perform and satisfy the ITAAC defined in Table 13.6A-1, "Site Specific Physical Security."

13.6.A.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to PS-ITAAC, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the relevant information presented in VCSNS COL FSAR and the additional information received in the letter dated June 11, 2010, is acceptable based on the applicable regulations specified in Section 13.6.A.4 of this SER. The staff based its conclusion on the following:

- STD SUP 14.3-1, as related to PS-ITAAC, is acceptable based on the following discussion. The NRC staff finds that the applicant adequately describes the physical security systems or provides and/or facilitates the implementation of the site-specific protective strategy and security programs. The applicant adequately describes the site-specific PS-ITAAC for meeting the requirements of 10 CFR 73.55 and provides the technical bases for establishing a PS-ITAAC for the protection against acts of radiological sabotage and theft of special nuclear material. The applicant includes systems and features as stated in VCSNS COL FSAR Chapter 13 and referenced TRs. The applicant has provided adequate descriptions of objectives, prerequisites, test methods, data required, and acceptance criteria for security related ITAAC for the approval of the VCSNS COL.

13.7 Fitness for Duty

13.7.1 Introduction

Pursuant to 10 CFR 52.79(a)(44), COL applications must include a description of the FFD program required by 10 CFR Part 26, "Fitness for Duty Programs," and its implementation. The FFD program is designed to provide reasonable assurance that: (1) individuals are trustworthy and reliable as demonstrated by the avoidance of substance abuse; (2) individuals are not under the influence of any substance, legal or illegal, or mentally or physically impaired from any cause, which in any way adversely affects their ability to safely and competently perform their duties; (3) measures are established and implemented for the early detection of individuals who are not fit to perform their duties; (4) the construction site is free from the presence and effects of illegal drugs and alcohol; (5) the work places are free from the presence and effects of illegal drugs and alcohol; and, (6) the effects of fatigue and degraded alertness on an individual's ability to safely and competently perform his or her duties are managed commensurate with maintaining public health and safety.

13.7.2 Summary of Application

VCSNS COL FSAR Section 13.7 is a new section added after Section 13.6 of the AP1000 DCD. The references that are currently in AP1000 DCD Section 13.7 have been redistributed to other VCSNS COL FSAR sections. There is no information associated with the FFD program incorporated by reference from the AP1000 DCD.

In addition, in VCSNS COL FSAR Section 13.7, the applicant provided the following:

Supplemental Information

- STD SUP 13.7-1

The applicant provided standard supplemental information in VCSNS COL FSAR Section 13.7 describing the FFD program for both the construction phase and the operating phase of the units. The construction phase program will be consistent with NEI 06-06, "Fitness for Duty Program Guidance for New Nuclear Power Plant Construction Sites," and the construction phase program will be implemented prior to onsite construction of safety- and security-related structures, systems, and components (SSCs). The operations phase program will be consistent with 10 CFR Part 26.

License Conditions

- Part 10, License Condition 6

The applicant proposed a license condition to provide a schedule to support the NRC's inspection of operational programs included in the VCSNS COL FSAR Table 13.4-201 including the FFD program.

13.7.3 Regulatory Basis

The applicable regulatory requirements for STD SUP 13.7-1 are as follows:

- 10 CFR Part 26, "Fitness for duty programs"
- 10 CFR 52.79(a)(44)

Regulatory guidance for FFD programs is included in RG 1.206.

13.7.4 Technical Evaluation

The NRC staff reviewed Section 13.7 of the VCSNS COL FSAR to ensure that the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application addresses the required information relating to the FFD program.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Instead of confirming that all responses to RAIs identified in the corresponding standard content evaluation were endorsed by the VCSNS applicant (which is a typical step when comparing the two applications), the NRC staff provides its evaluation of similar RAIs issued to VCSNS, following the standard content material. The one confirmatory item in the standard content material retains the number assigned in the VEGP SER, and is also addressed following the standard content material.

The following portion of this technical evaluation section is reproduced from Section 13.7.4 of the VEGP SER:

Supplemental Information

- *STD SUP 13.7-1*

The applicant provided a new Section 13.7 in the VEGP COL FSAR describing the FFD program. STD SUP 13.7-1 added the following text to Section 13.7:

> *The Fitness for Duty (FFD) Program (Program) is implemented and maintained in two phases; the construction phase program*

and the operating phase program. The construction and operations phase programs are implemented as identified in [FSAR] *Table 13.4-201.*

The construction phase program is consistent with NEI 06-06 ([FSAR] *Reference 201). The workforce population subject to random testing during construction is determined on a weekly basis by averaging the total number of active construction badges over each preceding seven-day period. The random selection from each week's workforce population is identified by a standard computer-generated random number generator using this number of active badges as the range of numbers considered in the weekly random testing selection.*

The operations phase program is consistent with 10 CFR Part 26.

The staff notes that Reference 201 in the above text refers to Revision 4 of NEI 06-06.

The NRC staff's review of STD SUP 13.7-1 included the following: (1) the adequacy of the FFD program for the construction phase; (2) the adequacy of the FFD program for the operations phase; and (3) the implementation schedule proposed by the applicant for both the construction phase and operations phase FFD operational programs.

The NRC staff issued three RAIs to obtain further clarification on the applicant's FFD Program. The first two RAIs discussed below are associated with the resolution of STD SUP 13.7-1.

In RAI 13.6-33, the staff asked how the applicant intends to update its FFD program for the construction phase. NEI 06-06 provides examples of the FFD program that is required and, if this guidance is endorsed by the NRC, will provide an acceptable method of complying with the NRC's regulations. If the NRC endorses NEI 06-06, does the applicant intend to update its FFD program for the construction phase to comply with NEI 06-06? If future revisions to NEI 06-06 are endorsed by the NRC, does the applicant intend to update its FFD program for the construction phase to comply with certain clarifications, additions, and exceptions in these future, endorsed revisions, as necessary?

The applicant replied that it submitted an FFD Program for NRC approval as part of the Limited Work Authorization (LWA) request, and that the program is now being implemented as part of the construction activities. If NEI 06-06 is endorsed by the NRC, SNC plans to transition to a program that follows the guidance in NEI 06-06. The COL application currently commits to NEI 06-06, Revision 4, and will be changed in a future revision to commit to NEI 06-06, Revision 5. The applicant will evaluate substantial changes in subsequent revisions to NEI 06-06 and modify the construction phase FFD program to incorporate those substantial changes determined to be appropriate.

The applicant's response to RAI 13.6-33, as well as its supplemental response, revises Section 13.7 to address the issues discussed above. The relevant

portion of the proposed revised text, to be included in a future revision of the VEGP COL FSAR, is included below:

> *The Fitness for Duty Program (FFD) is implemented and maintained in multiple and progressive phases dependent on the activities, duties, or access afforded to certain individuals at the construction site. In general, two different FFD programs will be implemented: a construction FFD program and an operations FFD program. The construction and operations phase programs are illustrated in* [FSAR] *Table 13.4-201.*
>
> *The construction FFD program is consistent with NEI 06-06 (*[FSAR] *Reference 201). NEI 06-06 applies to persons constructing or directing the construction of safety- and security-related structures, systems, or components performed onsite where the new reactor will be installed and operated. Management and oversight personnel, as further described in NEI 06-06, and security personnel prior to the receipt of special nuclear material in the form of fuel assemblies (with certain exceptions) will be subject to the operations FFD program that meets the requirements of 10 CFR Part 26, Subparts A through H, N, and O. At the establishment of a protected area, all persons who are granted unescorted access will meet the requirements of an operations FFD program. Prior to issuance of a Combined License, the construction FFD program at a new reactor construction site for those subject to Subpart K will be reviewed and revised as necessary should substantial revisions occur to either NEI 06-06 following NRC endorsement or the requirements of 10 CFR Part 26.*

The staff notes that Reference 201 in the above text refers to Revision 5 of NEI 06-06.

In RAI 13.6-34, the staff asked the applicant to: (1) describe how FSAR Table 13.4-201, Item 15, related to the security operational program, comports with 10 CFR 26.3, "Scope," and 10 CFR 26.4, and the guidance provided in the NRC's letter to NEI dated December 2, 2009, entitled "Status of U.S. Nuclear Regulatory Commission Review and Endorsement of NEI 06-06, 'Fitness for Duty Program Guidance for New Nuclear Power Plant Construction Sites,'" and (2) provide site-specific information to clearly and sufficiently describe the applicant's FFD program. This information would include, but is not limited to, any deviations or exceptions to the requirements of 10 CFR Part 26 as further described in NEI 06-06.

The applicant stated that the response to RAI 13.6-33 provided the changes to the COL application that will describe the FFD program required by 10 CFR Part 26. Site-specific information is also provided in that response to clarify which program will be used to cover the various classifications of workers that must be covered in accordance with 10 CFR Part 26. The applicant's response to RAI 13.6-35 (below) revises FSAR Table 13.4-201, Item 20 to address the guidance provided in the NRC's December 2, 2009 letter. The

proposed revision to Item 20 of FSAR Table 13.4-201, to be included in a future revision of the VEGP COL FSAR, is included below:

Item	Program Title	Program Source (required by)	FSAR Section	Implementation Milestone	Implementation Requirements
20.	Fitness for Duty (FFD) Program for Construction (workers and first-line supervisors)	10 CFR 26.4(f)	13.7	Prior to initiating 10 CFR Part 26 construction activities	10 CFR Part 26, Subpart K
	FFD Program for Construction (management and oversight personnel)	10 CFR 26.4(e)	13.7	Prior to initiating 10 CFR Part 26 construction activities	10 CFR Part 26, Subparts A - H, N, and O
	FFD Program for Security Personnel	10 CFR 26.4(e)(1)	13.7	Prior to initiating 10 CFR Part 26 construction activities	10 CFR Part 26, Subparts A - H, N, and O
		10 CFR 26.4(a)(5) or 26.4(e)(1)		Prior to the earlier of: A. Licensee's receipt of SNM in the form of fuel assemblies, or B. Establishment of a protected area, or C. The 10 CFR 52.103(g) finding	10 CFR Part 26, Subparts A - I, N, and O
	FFD Program for FFD Program personnel	10 CFR 26.4(g)	13.7	Prior to initiating 10 CFR Part 26 construction activities	10 CFR Part 26, Subparts A, B, D - H, N, O, and C per licensee's discretion
	FFD Program for persons required to physically report to the Technical Support Center (TSC) or Emergency Operations Facility (EOF)	10 CFR 26.4(c)	13.7	Prior to the conduct of the first full-participation emergency preparedness exercise under 10 CFR Part 50, App. E, Section F.2.a	10 CFR Part 26, Subparts A - I, N, and O, except for §§ 26.205 – 209
	FFD Program for Operation	10 CFR 26.4(a) and (b)	13.7	Prior to the earlier of: A. Establishment of a protected area, or B. The 10 CFR 52.103(g) finding	10 CFR Part 26, Subparts A - I, N, and O, except for individuals listed in § 26.4(b), who are not subject to §§ 26.205 – 209

In its December 2, 2009, letter to NEI, the NRC stated that during the review and approval process for NEI 06-06, the applicant should provide the following statements in its application:

- *NEI 06-06, Revision 5 was used in the development of the construction site FFD program.*

- *The applicant will review and revise its construction site FFD program as necessary to ensure that it comports with the NRC-endorsed version of NEI 06-06.*

- *If the NRC staff's review of NEI 06-06 results in substantive changes to the most recent, docketed FFD program description provided by the applicant, the applicant must amend its application to reflect the changes.*

The applicant's proposed revisions to FSAR Section 13.7 satisfactorily address the three items described above. The December 2, 2009, letter also provided implementation milestones for consideration by applicants. The staff confirmed that the proposed revisions to FSAR Table 13.4-201, Item 20, include all of the implementation milestones in the December 2, 2009, letter.

Therefore, based on the staff's acceptance of the proposed revisions to FSAR Section 13.7 and to FSAR Table 13.4-201, Item 20, as noted above, the NRC staff concludes that the applicant has satisfactorily addressed STD SUP 13.7-1 by providing sufficient information on the FFD program for both the construction phase and the operating phase of the units. The inclusion of this information in a future revision of the VEGP COL FSAR is ***Confirmatory Item 13.7-1****.*

Resolution of VEGP Site-Specific Confirmatory Item 13.7-1

Confirmatory Item 13.7-1 is an applicant commitment to revise its FSAR Section 13.7 and Table 13.4-201 regarding the FFD program for the construction phase and the operating phase of the units. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 13.7-1 is now closed.

License Conditions

In RAI 13.6-35, the staff asked the applicant if proposed License Condition 3, A.1, and G.7, described in Part 10 of the COL application comports with FSAR Table 13.4-201, Item 15, which itemizes the aspects of the security operational program.

The staff further evaluated the need for License Condition 3, A.1 and G.7, for the VEGP COL application and determined it was not needed because the implementation milestones for FFD are governed by 10 CFR Part 26. The staff communicated this information to SNC, which then submitted Supplement 1 to its response to this RAI, removing this license condition for FFD.

- *Part 10, License Condition 6*

The applicant proposed a license condition in Part 10 of the VEGP COL application to provide a schedule to support the NRC's inspection of operational programs, including the FFD program.

The proposed license condition is consistent with the policy established in SECY 05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria," for operational programs and is acceptable.

Evaluation of VCSNS RAIs

The NRC staff issued RAIs to the VCSNS applicant that mirrored the RAIs issued to the VEGP applicant. Specifically, RAIs 13.6.1-1, 13.6.1-2, and 13.6.1-3 issued to the VCSNS applicant correspond to RAIs 13.6-33, 13.6-34, and 13.6-35, respectively, issued to the VEGP applicant.

The NRC staff's evaluation of the responses provided by the VCSNS applicant to the three questions related to the FFD program is discussed below. The VCSNS applicant responded to these three RAIs in a letter dated March 15, 2010, and superseded its response to RAI 13.6.1-3 in its letter dated July 1, 2010.

In response to RAI 13.6.1-1, the VCSNS applicant stated that it currently commits to NEI 06-06, Revision 4, and will change its application in a future revision to commit to NEI 06-06, Revision 5. The VCSNS applicant stated that it will evaluate substantial changes in subsequent revisions to NEI 06-06 and modify the construction phase FFD program to incorporate those substantial changes determined to be appropriate. The applicant's response to RAI 13.6.1-1 revised Section 13.7 to address the issues discussed above. The relevant portion of the proposed revised text, to be included in a future revision of the VCSNS COL FSAR, is included below:

> The Fitness for Duty Program (FFD) is implemented and maintained in multiple and progressive phases dependent on the activities, duties, or access afforded to certain individuals at the construction site. In general, two different FFD programs will be implemented: a construction FFD program and an operations FFD program. The construction and operations phase programs are illustrated in Table 13.4-201.
>
> The construction FFD program is consistent with NEI 06-06 ([FSAR] Reference 201). NEI 06-06 applies to persons constructing or directing the construction of safety- and security- related structures, systems, or components performed onsite where the new reactor will be installed and operated. Management and oversight personnel, as further described in NEI 06-06, and security personnel prior to the receipt of special nuclear material in the form of fuel assemblies (with certain exceptions) will be subject to the operations FFD program that meets the requirements of 10 CFR Part 26, Subparts A through H, N, and 0. At the establishment of a protected area, all persons who are granted unescorted access will meet the requirements of an operations FFD program. Prior to issuance of a Combined License, the construction FFD program at a new reactor construction site for those subject to Subpart K will be reviewed and

revised as necessary should substantial revisions occur to either NEI 06-06 following NRC endorsement or the requirements of 10 CFR Part 26.

In response to RAI 13.6.1-2, the VCSNS applicant stated that the response to RAI 13.6.1-1 provides the changes to the COL application that will describe the FFD program required by 10 CFR Part 26. The site-specific information is also provided in that response to clarify which program will be used to cover the various classifications of workers that must be covered in accordance with 10 CFR Part 26. The response to RAI 13.6.1-3 provides the information on modifications to VCSNS COL FSAR Table 13.4-201, Item 20 to address the guidance provided in the NRC's December 2, 2009, letter to NEI. That RAI response includes changes to License Condition 3, Items A, C, and D in Part 10 of the COL application to align with the changes to VCSNS COL FSAR Table 13.4-201. The NRC staff verified that the proposed changes to VCSNS COL FSAR Table 13.4-201, Item 20 are identical to the proposed changes to the corresponding VEGP COL FSAR Table 13.4-201, which is provided in the standard content evaluation material above.

In response to RAI 13.6.1-3, the VCSNS applicant stated that it would remove from proposed License Condition 3 any reference to implementation milestones for the FFD program, since these implementation requirements are in the applicable NRC regulations.

The NRC staff compared the responses provided by the VCSNS applicant to the responses provided by the VEGP applicant, and concluded that the responses are essentially identical, after accounting for the differences of an Early Site Permit having been issued for the VEGP site for this issue. Therefore, the conclusions reached by the NRC staff regarding the FFD program at VEGP are applicable to the FFD program at VCSNS. The inclusion of the information provided in the RAI responses in a future revision of the VCSNS COL FSAR is part of **Confirmatory Item 13.7-1** that is discussed in the standard content portion of this safety evaluation above.

13.7.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff finds the following license condition proposed by the applicant acceptable:

- License Condition (13-6) - No later than 12 months after issuance of the COL, the licensee shall submit to the Director of NRO a schedule that supports planning for and conduct of NRC inspection of the FFD operational program. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the FFD operational program has been fully implemented.

13.7.6 Conclusion

The NRC staff's review confirmed that the applicant addressed the required information relating to the FFD program and there is no outstanding information to be addressed in the VCSNS COL FSAR related to this section.

The staff concludes that the information presented in the VCSNS COL FSAR is acceptable because it meets the regulatory requirements in 10 CFR Part 26 and 10 CFR 52.79(a)(44). The staff based its conclusion on the following:

- STD SUP 13.7-1, relating to the FFD program, is acceptable because it meets 10 CFR Part 26 and 10 CFR 52.79(a)(44).

13.8 Cyber Security

13.8.1 Introduction

In a letter to the NRC, dated June 22, 2010, SCE&G submitted Revision 0 of the CSP for VCSNS Units 2 and 3. The CSP applies to all critical digital assets required for VCSNS operation. In the submittal, the applicant describes how the requirements of 10 CFR 73.54 will be implemented to protect digital computer and communications systems and networks associated with the following functions from those cyber attacks, up to and including the design-basis threat (DBT) described in 10 CFR 73.1, "Purpose and Scope." The scope of 10 CFR 73.54 includes critical digital assets (CDAs) associated with the following:

- safety-related and important-to-safety functions
- security functions
- emergency preparedness functions, including offsite communications
- support systems and equipment which, if compromised, would adversely impact safety, security, or emergency preparedness functions

13.8.2 Summary of Application

The applicant addresses cyber security in Section 13.6 of the VCSNS COL FSAR. Section 13.6 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 13.6 of the AP1000 DCD, Revision 19. The applicant's CSP includes deviations from RG 5.71, "Cyber Security Programs for Nuclear Facilities." The staff has evaluated these deviations.

In addition, in VCSNS COL FSAR Section 13.6, the applicant provides the following:

AP1000 COL Information Item

- STD COL 13.6-5

The applicant provided additional information in STD COL 13.6-5 to address COL Information Item 13.6-5, which provides information related to the cyber security program.

License Conditions

- Part 10, License Condition 3, Item G.10

The applicant proposed a license condition in Part 10 of the VCSNS COL application requiring the applicant to implement the cyber security program prior to initial fuel load.

- Part 10, License Condition 6

The applicant proposed a license condition in Part 10 of the VCSNS COL application to provide a schedule to support the NRC's inspection of operational programs included in VCSNS COL FSAR Table 13.4-201 including the cyber security program.

13.8.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

The applicable regulatory requirements for cyber security are as follows:

- 10 CFR 73.1, "Purpose and scope"
- 10 CFR 73.54, "Protection of digital computer and communication systems and networks"
- 10 CFR 73.55, "Requirements for physical protection of licensed activities in nuclear power reactors against radiological sabotage," paragraphs (a)(1), (b)(8), and (m)
- 10 CFR 73.58, "Safety/security interface requirements for nuclear power reactors"
- 10 CFR Part 73, "Physical protection of plants and materials," Appendix G, "Reportable Safeguards Events"

The applicable regulatory guidance for cyber security is RG 5.71.

13.8.4 Technical Evaluation

The NRC staff reviewed Section 13.6 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to cyber security. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff's review of the VCSNS CSP has focused on ensuring that the necessary programmatic elements are included in these plans to provide high assurance that activities involving special nuclear material are not inimical to the common defense and security and do not constitute an unreasonable risk to the public health and safety. The staff reviewed the VCSNS CSP to assure the necessary programmatic elements that, when effectively implemented, will provide the required high assurance of adequate protection. Effective implementation is dependent on the procedures and practices the applicant develops to satisfy the programmatic elements of its CSP. The facility implementing procedures are subject to future NRC inspection.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that the June 22, 2010, VCSNS submittal transmitting its CSP was identical to the June 14, 2010, VEGP submittal transmitting its CSP, with the only exceptions being to the title of the units and the identification of the position charged with oversight of the program.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This finding included verifying that the difference in the position charged with oversight of the program (the General Manager, Organizational Effectiveness at VCSNS and Vice President of Nuclear Operations Support at VEGP) does not affect the staff's conclusions regarding the applicant's CSP. This standard content material is identified in this SER by use of italicized, double-indented formatting. The one confirmatory item in the standard content material retains the number assigned in the VEGP SER.

The following portion of this technical evaluation section is reproduced from Section 13.8.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 13.6-5*

The NRC staff reviewed STD COL 13.6-5 related to COL Information Item 13.6-5, which identifies the need for a COL applicant to address cyber security. STD COL 13.6-5 supplemented Section 13.6 of the VEGP COL FSAR by stating the following text is to be added after Section 13.6 of the VEGP ESP SSAR:

> *The Cyber Security Plan is submitted to the Nuclear Regulatory Commission as a separate licensing document to fulfill the requirements contained in 10 CFR 52.79(a)(36) and 10 CFR 73.54. The Cyber Security Plan will be maintained in accordance with the requirements of 10 CFR 52.98. The Plan is withheld from public disclosure pursuant to 10 CFR 2.390.*

Section 13.6 of the VEGP COL FSAR also refers to FSAR Table 13.4-201, "Operational Programs Required by NRC Regulations," as providing the milestone for implementing the cyber security program.

The VEGP applicant submitted its Revision 0 of its CSP in a letter dated June 14, 2010, to demonstrate that the cyber security program will provide high assurance that digital computer and communication systems and networks are adequately protected against cyber attacks, up to and including the DBT as described in 10 CFR 73.1. The CSP has been withheld from public disclosure pursuant to 10 CFR 2.390(d)(1). In its review of this plan, the NRC staff used the guidance in RG 5.71 to determine if the regulatory requirements described in Section 13.8.3 of this SER are satisfied.

The applicant described the cyber security program based on 10 CFR 73.54, including the audit of the effectiveness of the cyber security program as required by 10 CFR 73.55(m), submittal of CSPs and the establishment, maintenance and implementation of a cyber security program required by 10 CFR 73.55(a)(1) and 10 CFR 73.55(b)(8) and reporting requirements in 10 CFR Part 73, Appendix G. The implementation milestones for this program are included in VEGP COL FSAR Table 13.4-201.

As detailed in the remainder of this SER section, the CSP has been reviewed by the NRC staff for format and content utilizing the NRC CSP template in RG 5.71, and found to include all features considered essential for such a program, and is acceptable. In particular, it has been found to comply with the Commission's regulations including 10 CFR 73.54, 10 CFR 73.55(a)(1), 10 CFR 73.55(b)(8), 10 CFR 73.55(m), and 10 CFR Part 73, Appendix G and conforms to the NRC CSP template set forth in RG 5.71.

The applicant has committed to incorporate this CSP into a future revision of the VEGP COL application to address NRC requirements in 10 CFR 73.54. This action will be tracked as ***Confirmatory Item 13.8-1.***

Resolution of VEGP Site-Specific Confirmatory Item 13.8-1

Confirmatory Item 13.8-1 is an applicant commitment to include the CSP into a future revision of the VEGP COL application. The staff verified that the VEGP COL application was appropriately revised. As a result, Confirmatory Item 13.8-1 is now closed.

13.8.4.1 Establishment of Cyber Security Program

The VEGP CSP describes how SNC will establish a cyber security program to achieve high assurance that the VEGP digital computer and communication systems and networks associated with safety, security, and emergency preparedness, including offsite communications and support systems and equipment which if compromised would adversely impact safety, security and/or emergency preparedness (SSEP) functions, and their digital assets, hereafter defined as CDAs, are adequately protected against cyber attacks up to and including the DBT. RG 5.71 provides a method that the staff considers acceptable for complying with this regulation. SNC complies with the requirements of 10 CFR 73.54 by providing a CSP that follows the template in Appendix A of RG 5.71, except as noted in Attachment A, "Vogtle Electric

Generating Plant Units 3 and 4 Cyber Security Plan Deviations from Regulatory Guide RG 5.71." The VEGP CSP included:

> *Within the scope of the NRC's cyber security rule at 10 CFR 73.54, systems or equipment that perform important to safety functions include structures, systems, and components (SSCs) in the balance of plant (BOP) that could directly or indirectly affect reactivity at a nuclear power plant and could result in an unplanned reactor shutdown or transient. Additionally, these SSCs are under the licensee's control and include electrical distribution equipment out to the first inter-tie with the offsite distribution system.*

The VEGP CSP included a deviation from the guidance to clarify that systems or equipment that perform important to safety functions include SSCs in the balance of plant (BOP) that could directly or indirectly affect reactivity and could result in an unplanned reactor shutdown or transient. This deviation is consistent with Commission policy.

The NRC staff reviewed the VEGP CSP against the template in RG 5.71 and the staff requirements memorandum (SRM), CMWCO-10-0001, "Regulation of Cyber Security at Nuclear Power Plants," dated October 21, 2010.

The applicant states in the VEGP CSP that its security program complies with 10 CFR 73.54 by:

(1) establishing and implementing defensive strategies consistent with the defensive model, described in Section 3.1.5, including the security controls described in Sections 3.1, 3.2, and 3.3.

(2) maintaining the program, as described in Section 4.

Based on the above review, the NRC staff finds that establishment of a cyber security program described in Section 1 of the VEGP CSP is acceptable.

The following SER Sections 13.8.4.2 through 13.8.4.23 correlate to specific sections in Appendix A to RG 5.71. These SER sections use the same headings as the corresponding Appendix A sections, and include the Appendix A numbering system in the titles. SER Section 13.8.4.24 addresses each of the deviations identified in the applicant's CSP.

13.8.4.2 <u>Security Assessment and Authorization (Section A.3.1.1 of Appendix A to RG 5.71)</u>

Section 3.1.1 of the VEGP CSP states that the following will be reviewed every 24 months:

- *A formal documented security planning, assessment, and authorization policy that describes the purpose, scope, roles, responsibilities, management commitments, and coordination among departments and*

the implementation of the security program and the controls applied in accordance with Section 3.1.6

- *A formal documented procedure to facilitate the implementation of the cyber security program and the security assessment*

The NRC staff reviewed the above and found that evaluation of the program elements every 24 months is not consistent with Section C.3.1.1 of RG 5.71. The time period between evaluations is 12 months longer than the time period provided in brackets in RG 5.71. However, this 24-month time period conforms to 10 CFR 73.54(g), requiring the applicant to review the cyber security program as a component of the physical security program in accordance with the requirements of 10 CFR 73.55(m), including the periodicity requirements. The requirement of 10 CFR 73.55(m) is that at minimum the applicant review each element of the physical protection program at least every 24 months.

Based on the above review, the NRC staff finds that the security assessment and authorization described in Section 3.1.1 of the VEGP CSP is acceptable.

13.8.4.3 Cyber Security Team (Section A.3.1.2 of Appendix A to RG 5.71)

Section 3.1.2 of the VEGP CSP states that a cyber security team, composed of individuals with broad knowledge, will be established and maintained and that the broad knowledge of the team will include the following areas:

- *Information and digital system technology; this includes cyber security, software development, offsite communications, computer system administration, computer engineering, and computer networking.*

- *Nuclear facility operations, engineering, and safety; this includes overall facility operations and plant technical specification compliance.*

- *Physical security and emergency preparedness; this includes the site's physical security and emergency preparedness systems and programs.*

This section of the VEGP CSP also enumerates the roles and responsibilities of the cyber security team. Aside from the deviations discussed below, this section of the VEGP CSP conforms to the CSP template wording provided in Section A.3.1.2 of RG 5.71.

The VEGP CSP includes several deviations from the text of RG 5.71:

1) *The first deviation clarifies that the cyber security team (CST) will be responsible for "overseeing" preparation of documentation of cyber security controls and that, in fact, non-team members (such as vendor personnel) may perform some of these actions, under the supervision of the CST. This clarification is acceptable to the staff since the responsibility to ensure compliance with 10 CFR 73.54 remains with the CST.*

2) *The second deviation changes the CST responsibility from "assuring the retention" of assessment documentation to "establishing the retention policy" for assessment documentation. Again, the deviation is acceptable to the staff since the responsibility to ensure compliance with 10 CFR 73.54 remains with the CST.*

3) *The third and final deviation seeks to change the basis for CST determinations being made in a free and objective manner. The RG 5.71 wording states that the CST should be free to make determinations that are not constrained by "operational goals." The deviation changes the respective sentence to say "…by business goals." Again, the deviation is acceptable to the staff since it maintains the same objective of keeping financial considerations out of decision making regarding cyber security.*

Based on the above review, the NRC staff finds that the CST described in Section 3.1.2 of the VEGP CSP is acceptable.

13.8.4.4 Identification of Critical Digital Assets (Section A.3.1.3 of Appendix A to RG 5.71)

Section 3.1.3 of the VEGP CSP states that to identify the critical systems (CSs) at VEGP, the CST identified and documented plant systems, equipment, communication systems, and networks that are associated with the SSEP functions described in 10 CFR 73.54(a)(1), as well as the support systems associated with these SSEP functions in accordance with the approved plant licensing basis.

The VEGP CSP also states that the CST identified and documented CDAs that have a direct, supporting, or indirect role in the proper functioning of CSs.

The steps outlined in the VEGP CSP essentially match the corresponding steps described in RG 5.71 for this same activity. The only difference between the corresponding section in RG 5.71 and the VEGP CSP is the addition of the modifying phrase: "…and defined in the approved plant licensing basis."

10 CFR 73.54(a)(1) requires that the licensee protect digital computer and communication systems and networks associated with: (i) safety-related and important-to-safety functions; (ii) security functions; (iii) emergency preparedness functions, including offsite communications; and (iv) support systems and equipment which, if compromised, would adversely impact SSEP functions.

This deviation is acceptable because SNC proposes to use its licensing basis to identify CSs that are associated with SSEP functions, as 10 CFR 73.54 requires. This statement includes the first step in RG 5.71 to analyze digital computer and communication systems and networks to determine if they include CDAs.

Based on the above review, the NRC staff finds the applicant's proposal, described in Section 3.1.3 of the VEGP CSP, to use 10 CFR 73.54(a)(1) and its licensing basis to identify CDAs to be acceptable.

13.8.4.5 Reviews and Validation Testing (Section A.3.1.4 of Appendix A to RG 5.71)

Section 3.1.4 of the VEGP CSP states that the VEGP CST will be responsible for conducting a review, performing validation activities, and for each CDA, the CST determined:

- *its direct and indirect connectivity pathways*
- *infrastructure interdependencies*
- *the application of defensive strategies, including defensive models, security controls, and other defensive measures*

The CSP also requires that the CST validate the above activities through comprehensive walkdowns, which include a range of activities that conform to those activities specified in RG 5.71 for this purpose.

The requirements, processes and procedures described in this section of the VEGP CSP conform to, and encompass all of the same specifications, outlined in the comparable section of RG 5.71.

Based on the above review, the NRC staff finds that reviews and validation testing described in Section 3.1.4 of the VEGP CSP is acceptable.

13.8.4.6 Defense-In-Depth Protective Strategies (Section A.3.1.5 of Appendix A to RG 5.71)

Section 3.1.5 of the VEGP CSP states that the defensive strategy consists of the defensive model described in Section C.3.2 of RG 5.71, and the detailed defensive architecture of Appendix C, Section 6, defense-in-depth controls in Appendix C, Section 7, and security controls applied in accordance with Section 3.1.6 of the VEGP CSP with one deviation to its defensive architecture. The VEGP defensive architecture, including the deviation is consistent with the security model described in RG 5.71, which provides for isolation of safety-related and security CDAs.

Based on the above review, the NRC staff finds that the defense-in-depth protective strategies described in Section 3.1.5 of the VEGP CSP are acceptable.

13.8.4.7 Application of Security Controls (Section A.3.1.6 of Appendix A to RG 5.71)

Section 3.1.6 of the VEGP CSP states that VEGP Units 3 and 4 established defense-in-depth protective strategies by applying and documenting the following:

- *the defensive model described in Section 3.2 of RG 5.71 (discussed in SER Section 13.8.4.6)*

- *the physical and administrative security controls established by the VEGP Units 3 and 4 Physical Security Program and physical barriers, such as locked doors, locked cabinets, and locating CDAs in the VEGP Units 3 and 4 protected area or vital areas, which are part of the overall security controls used to protect CDAs from attacks*

- *verification of the effectiveness of the implemented operational and management controls described in Appendix C to RG 5.71 and implemented alternatives to the Appendix C controls for each CDA*

- *the technical controls described in Appendix B to RG 5.71 and the operational and management controls described in Appendix C to RG 5.71, consistent with the process described below*

The VEGP CSP deviates from RG 5.71, Section C.3.3 Security Controls and Appendix A.3.1.6, by stating that when a control from Appendices B and C of RG 5.71 is not implemented, the licensee will implement alternate control(s) that "do not provide less protection than the corresponding" control in the appendix. This deviation is consistent with the method used in RG 5.71, which states that controls should provide equal or better protection.

The VEGP CSP also deviates from RG 5.71 by stating that when a control can be proved to be unnecessary, the applicant will perform an analysis demonstrating that the control is not necessary, and will provide a documented justification. Although RG 5.71 specifically calls for an attack vector analysis, and the VEGP CSP does not specifically commit to performing an attack vector analysis, the VEGP CSP does commit to justifying the non-applicability of a control by demonstrating that the attack vector does not exist. This provides for the same outcome as RG 5.71.

Based on the above review, the NRC staff finds that the application of security controls described in Section 3.1.6 of the VEGP CSP is acceptable.

13.8.4.8 <u>Incorporating the Cyber Security Program into the Physical Protection Program (Section A.3.2 of Appendix A to RG 5.71)</u>

Section 3.2 of the VEGP CSP states that the licensee will provide the management interfaces necessary to appropriately coordinate physical and cyber security activities, as follows:

- *establish an organization that is responsible for cyber security and is independent from operations*

- *document physical and cyber security interdependencies*

- *develop policies and procedures to coordinate management of physical and cyber security controls*

- *incorporate unified policies and procedures to secure CDAs from attacks up to and including the DBT*

- *coordinate acquisition of physical or cyber security services, training, devices, and equipment*

- *coordinate interdependent physical and cyber security activities and training with physical and cyber security personnel*

- *integrate and coordinate incident response capabilities with physical and cyber incident response personnel*

- *train senior management regarding the needs of both disciplines*

- *periodically exercise the entire security organization using realistic scenarios combining both physical and cyber simulated attacks*

The VEGP CSP deviates from RG 5.71 by not creating a unified security organization. The commitment to provide for appropriate management interfaces to coordinate the physical and cyber security organizations provides for a level of integration equivalent to a unified organization.

Based on the above review, the NRC staff finds that the incorporation of the cyber security program into the physical protection program described in Section 3.2 of the VEGP CSP is acceptable.

13.8.4.9 Policies and Implementing Procedures (Section A.3.3 of Appendix A to RG 5.71)

Section 3.3 of the VEGP CSP states that the licensee will develop policies and procedures to address the security controls in Appendices B and C to RG 5.71 and review and approve issues and uses, and revise the same according to Section 4 of the CSP. The CSP will also establish specific responsibilities for the positions described in Section 10.10 of Appendix C to RG 5.71, with the following deviation.

The CSP states that this will occur "in accordance with the security control application process in Section 3.1.6 of this Plan." This process requires the applicant to justify and demonstrate that any deviation from the controls in RG 5.71 provide no less protection than the corresponding control in Appendices B and C; therefore, the VEGP CSP will require the same level of protection as the corresponding commitment in RG 5.71.

Based on the above review, the NRC staff finds that the policies and implementing procedures described in Section 3.3 of the VEGP CSP are acceptable.

13.8.4.10 Maintaining the Cyber Security Program (Section A.4 of Appendix A to RG 5.71)

Section 4 of the VEGP CSP states that the applicant will establish the programmatic elements necessary to maintain security throughout the life cycle of the CDAs, and that the applicant has implemented these elements. For new assets, SNC commits to follow the process described in Section 4.2.

Section 4 of the VEGP CSP is nearly identical to Section C.4 of RG 5.71, with the deviation of replacing the bracketed text [Licensee/Applicant] *with VEGP Units 3 and 4, and by including the caveat that the operational and management controls are applied following the process described in Section 3.1.6. The process described in Section 3.1.6 allows the licensee/applicant to not apply a control if it can demonstrate that the control is not necessary by justifying that the attack vector associated with the control does not exist. This approach is consistent with the method used in RG 5.71, and does not reduce the protection to the plant.*

Based on the above review, the NRC staff finds that the maintenance of the cyber security program described in Section 4 of the VEGP CSP is acceptable.

13.8.4.11 Continuous Monitoring and Assessment (Section A.4.1 of Appendix A to RG 5.71)

Section 4.1 of the VEGP CSP states that the licensee will continue to monitor security controls for effectiveness; will ensure that they remain in place throughout the life cycle of the CDA; and will verify that rogue assets are not connected to the infrastructure.

The VEGP CSP includes a single deviation from Section A.4.1 of RG 5.71. The RG states that "[Licensee/Applicant] *continuously monitors security controls consistent with Appendix C to RG 5.71," whereas the VEGP CSP states that "VEGP Units 3 and 4 continues to monitor security controls consistent with Appendix C to RG 5.71."*

This deviation is consistent with the method in RG 5.71, which calls for periodic assessments, which is consistent with the statement "continues to monitor."

Based on the above review, the NRC staff finds that the ongoing monitoring and assessment described in Section 4.1 of the VEGP CSP is acceptable.

13.8.4.12 Periodic Assessment of Security Controls (Section A.4.1.1 of Appendix A to RG 5.71)

Section 4.1.1 of the VEGP CSP states that the licensee will periodically assess that security controls implemented for each CDA remain robust, resilient, and effective in place throughout the life cycle, at least every 24 months.

The NRC staff reviewed the above and found that this period of assessment is not consistent with RG 5.71. The time period between evaluations is 12 months longer than the time period provided in RG 5.71. However, this 24-month time

period conforms to 10 CFR 73.54(g) requiring the licensee/applicant to review the cyber security program as a component of the physical security program in accordance with the requirements of 10 CFR 73.55(m), including the periodicity requirements. The requirements of 10 CFR 73.55(m) are that, at a minimum, the licensee/applicant review each element of the physical protection program, which includes the cyber security program, at least every 24 months.

Furthermore, the VEGP CSP states that controls will be reviewed according to the requirements of the security controls if that period of review occurs more often. This is also consistent with the method provided in RG 5.71.

Based on the above review, the NRC staff finds that the periodic assessment of security controls described in Section 4.1.1 of the VEGP CSP is acceptable.

13.8.4.13 Effectiveness Analysis (Section A.4.1.2 of Appendix A to RG 5.71)

Section 4.1.2 of the VEGP CSP states that the licensee will monitor and measure the effectiveness of the cyber security program and its security controls to ensure that both are implemented correctly, operating as intended, and continuing to provide high assurance that CDAs are protected against cyber attacks. The licensee commits to verifying the effectiveness of the security controls every 24 months, or in accordance with the specific requirements of the implemented security controls, whichever is more frequent.

The NRC staff reviewed the above and found that this period of verification is inconsistent with RG 5.71. The time period between evaluations is 12 months longer than the time period provided in RG 5.71. However, this 24-month time period conforms to 10 CFR 73.54(g) requiring the applicant to review the cyber security program as a component of the physical security program in accordance with the requirements of 10 CFR 73.55(m), including the periodicity requirements. The requirements of 10 CFR 73.55(m) are that, at a minimum, the applicant review each element of the physical protection program, which includes the cyber security program, at least every 24 months.

Furthermore, the VEGP CSP states that verification will also occur according to the requirements of the security controls if that period of verification occurs more often. This is also consistent with the method provided in RG 5.71.

Based on the above review, the NRC staff finds that the effectiveness analysis described in Section 4.1.2 of the VEGP CSP is acceptable.

13.8.4.14 Vulnerability Assessments and Scans (Section A.4.1.3 of Appendix A to RG 5.71)

Section 4.1.3 of the VEGP CSP states vulnerability assessments will be performed as specified in the security controls in Appendices B and C of RG 5.71 to identify new vulnerabilities that have the potential to impact the effectiveness of the cyber security program and the security of the CDAs. The applicant also commits to address vulnerabilities that could cause CDAs to become compromised or could have an adverse impact on SSEP functions. Section 13.1 of Appendix C of RG 5.71 provides that vulnerability assessments should occur

no less frequently than once a quarter, at random intervals, and when new potential vulnerabilities are reported and identified.

Section A.4.1.3 of RG 5.71 states that vulnerability assessments will occur no less frequently than quarterly, whereas the VEGP CSP states that this will occur, "as specified in the implemented security controls in Appendices B and C to RG 5.71 and implemented alternatives to the Appendices B and C controls." The process SNC has committed to in Section 3.1.6 of the VEGP CSP requires SNC, if it does not implement the controls in Appendices B and C, to demonstrate that an alternate control does not provide less protection than the corresponding control in Appendices B and C.

Therefore, if SNC does not implement the security control in Section 13.1, or deviates from the requirement for a quarterly vulnerability assessment, it will ensure that this deviation does not provide less protection than performing quarterly vulnerability assessments, and will provide an analysis that demonstrates that the attack vector does not exist and will document this justification for inspection.

Based on the above review, the NRC staff finds that the vulnerability assessments and scans described in Section 4.1.3 of the VEGP CSP are acceptable.

13.8.4.15 Change Control (Section A.4.2 of Appendix A to RG 5.71)

Section 4.2 of the VEGP CSP states that the licensee will systematically plan, approve, test, and document changes to the environment of the CDAs, the addition of CDAs to the environment, and changes to existing CDAs in a manner that provides a high level of assurance that the SSEP functions are protected from cyber attacks. The CSP also commits that the program establish that changes made to CDAs use the design control and configuration management procedures or other procedural processes to ensure that the existing security controls are effective and that any pathway that can be exploited to compromise a CDA is protected from cyber attacks.

The VEGP CSP does not deviate from Section A.4.2 of RG 5.71.

Based on the above review, the NRC staff finds that the change control process described in Section 4.2 of the VEGP CSP is acceptable.

13.8.4.16 Configuration Management (Section A.4.2.1 of Appendix A to RG 5.71)

Section 4.2.1 of the VEGP CSP states that the licensee will implement and document a change management process as described in Section 4.2 of the VEGP CSP. Further, it commits to implement and document the applied configuration management controls described in Appendix C, Section 11 to RG 5.71 following the process described in Section 3.1.6 of the CSP.

The VEGP CSP does not specifically commit to apply the security controls in Section 11 of Appendix C of RG 5.71; however, it does commit to apply the

process in Section 3.1.6 of the CSP. The commitment in Section 4.2.1 is consistent with Section A.4.2.2 of RG 5.71 as the applicant has committed, if it does not implement the security controls in Section 11 of RG 5.71, either to implement alternative controls that do not provide less protection than what is in Section 11, or to demonstrate that this control is unnecessary by demonstrating that the attack vectors associated with Section 11 to Appendix C of RG 5.71 do not exist for VEGP.

Based on the above review, the NRC staff finds that the configuration management process described in Section 4.2.1 of the VEGP CSP is acceptable.

13.8.4.17 Security Impact Analysis of Changes and Environment (Section A.4.2.2 of Appendix A to RG 5.71)

Section 4.2.2 of the VEGP CSP states that the applicant will perform a security impact analysis in accordance with Section 4.1.2 before implementing a design or configuration change to a CDA or, when changes to the environment occur, to manage potential risks introduced by the changes. The CSP also commits to evaluate, document, and incorporate into the security impact analysis safety and security interdependencies of other CDAs or systems, as well as updates, and documents the following:

- *the location of the CDA and connected assets*
- *connectivity pathways (direct and indirect)*
- *infrastructure interdependencies*
- *application of defensive strategies, including defensive models, security controls, and others*
- *defensive strategy measures*
- *plant-wide physical and cyber security policies and procedures that secure CDAs from a cyber attack, including attack mitigation and incident response and recovery*

The VEGP CSP commits to perform these impact analyses as part of the change approval process to assess the impacts of the changes on the security posture of CDAs and security controls, as described in Section 4.1.2 of the VEGP CSP, and to address any identified gaps to protect CDAs from cyber attack, up to and including the DBT as described in Section 4.2.6.

Finally, Section 4.2.2 states that the licensee will manage CDAs for the cyber security of SSEP functions through an ongoing evaluation of threats and vulnerabilities and implementation of each of the applied security controls provided in Appendix B or C of RG 5.71 and implement alternatives to the Appendices B and C controls during all phases of the life cycle. Additionally, SNC has established and documented procedures for screening, evaluating, mitigating, and dispositioning threat and vulnerability notifications received from

credible sources. Dispositioning includes implementation of security controls to mitigate newly reported or discovered threats and vulnerabilities.

The language in Section 4.2.2 of the VEGP CSP is identical to that in Section A.4.2.2 of RG 5.71 and includes no deviations.

Based on the above review, the NRC staff finds that the security impact analysis of changes and environment described in Section 4.2.2 of the VEGP CSP is acceptable.

13.8.4.18 Security Reassessment and Authorization (Section A.4.2.3 of Appendix A to RG 5.71)

Section 4.2.3 of the VEGP CSP states that the licensee will have implemented, documented, and maintained a process that ensures that modifications to CDAs are evaluated before implementation so that security controls remain effective and that any pathway that can be exploited to compromise the modified CDA is addressed to protect CDAs and SSEP functions from cyber attacks. This section further states that the VEGP cyber security program establishes that additions and modifications are evaluated, using a proven and accepted method, before implementation to provide high assurance of adequate protection against cyber attacks, up to and including DBTs, using the process described in Section 4.1.2 of the VEGP CSP.

The licensee also commits to disseminate, review, and update the following when a CDA modification is conducted:

- *a formal, documented security assessment and authorization policy, which addresses the purpose, scope, roles, responsibilities, management commitment, coordination among entities, and compliance to reflect all modifications or additions*

- *a formal, documented procedure to facilitate the implementation of the security reassessment and authorization policy and associated controls*

The VEGP CSP does not deviate from Section A.4.2.3 of RG 5.71.

Based on the above review, the NRC staff finds that the security reassessment and authorization described in Section 4.2.3 of the VEGP CSP is acceptable.

13.8.4.19 Updating Cyber Security Practices (Section A.4.2.4 of Appendix A to RG 5.71)

Section 4.2.4 of the VEGP CSP states that the licensee reviews, updates and modifies cyber security policies, procedures, practices, existing cyber security controls, detailed descriptions of network architecture (including logical and physical diagrams), information on security devices, and any other information associated with the state of the cyber security program or the applied security controls provided in Appendices B and C to RG 5.71 and implemented alternatives to the Appendices B and C controls when changes occur to CDAs or the environment.

This information includes the following:

- *plant- and corporate-wide information on the policies, procedures, and current practices related to cyber security*
- *detailed network architectures and diagrams*
- *configuration information on security devices or CDAs*
- *new plant- or corporate-wide cyber security defensive strategies or security controls being developed and policies, procedures, practices, and technologies related to their deployment*
- *the site's physical and operational security program*
- *cyber security requirements for vendors and contractors*
- *identified potential pathways for attacks*
- *recent cyber security studies or audits (to gain insight into areas of potential vulnerabilities); and identified infrastructure support systems (e.g., electrical power; heating, ventilation, and air conditioning; communications; fire suppression) whose failure or manipulation could impact the proper functioning of CSs*

The VEGP CSP does not deviate from Section A.4.2.4 of RG 5.71.

Based on the above review, the NRC staff finds that updating of cyber security practices described in Section 4.2.4 of the VEGP CSP is acceptable.

13.8.4.20 Review and Validation Testing of a Modification or Addition of a Critical Digital Asset (Section A.4.2.5 of Appendix A to RG 5.71)

The VEGP CSP Section 4.2.5 states the licensee will conduct and document the results of reviews and validation tests of each CDA modification and addition using the process described in Section 3.1.4 of the VEGP CSP.

The VEGP CSP does not deviate from Section A.4.2.5 of RG 5.71.

Based on the above review, the NRC staff finds that the Review and Validation Testing of Modifications or Additions of a Critical Digital Asset described in Section 4.2.5 of VEGP CSP is acceptable.

13.8.4.21 Application of Security Controls Associated with a Modification or Addition (Section A.4.2.6 of Appendix A to RG 5.71)

Section 4.2.6 of the VEGP CSP states that when new CDAs are introduced into the environment of VEGP, the licensee:

- *deploys the CDA into the appropriate level of the defensive model described in Section 3.1.5 of this plan;*
- *applies the technical controls identified in Appendix B to RG 5.71 and the operational and management controls described in Appendix C to RG 5.71 in a manner consistent with the process described in Section 3.1.6 of this plan*
- *confirms that the implemented operational and management controls described in Appendix C to RG 5.71, and implemented alternatives to the Appendix C controls, are effective for the CDA*

The plan also commits that when CDAs are modified, the licensee:

- *verifies that the CDA is deployed into the proper level of the defensive model described in Section 3.1.5 of this plan*
- *performs a security impact analysis, as described in Section 4.2.2 of this plan*
- *verifies that the technical controls identified in Appendix B to RG 5.71 and the operational and management controls described in Appendix C to RG 5.71 are addressed in a manner consistent with the process described in Section 3.1.6 of this plan*
- *verifies that the applied security controls discussed above are implemented effectively, consistent with the process described in Section 4.1.2 of this plan*
- *confirms that the implemented operational and management controls discussed in Appendix C to RG 5.71 and implemented alternatives to the Appendix C controls are effective for the CDA*

The VEGP CSP deviates from Section 4.2.6 of RG 5.71 by modifying the phrase "applies the technical controls identified in Appendix B to RG 5.71 in a manner consistent with the process described in Section 3.2 of RG 5.71," to read "applies the technical controls identified in Appendix B to RG 5.71 and the operational and management controls described in Appendix C to RG 5.71 in a manner consistent with the process described in Section 3.1.6 of this plan." This is consistent with RG 5.71 as the VEGP CSP commits to following the process in Section 3.1.6 of the VEGP CSP, which requires that controls are applied, an alternative that provides equivalent protection is provided, or the licensee demonstrates that the control is not necessary.

The VEGP CSP also deviates from Section A.4.2.6 of RG 5.71 with the modification of this phrase, "verifies that the security controls discussed above are implemented effectively, consistent with the process described in Section 4.1.2 of this plan" to read "verifies that the applied security controls discussed above are implemented effectively, consistent with the process described in Section 4.1.2 of this plan."

This deviation is consistent with the method used in RG 5.71. RG 5.71 assumes that all the controls in Appendices B and C will be applied; whereas, the VEGP CSP commits that if a control is not applied, there will be no reduction in protection as compared to the corresponding control. This method is also captured in RG 5.71 and, therefore, the VEGP CSP is consistent with RG 5.71.

Based on the above review, the NRC staff finds that the application of security controls associated with a modification or addition described in Section 4.2.6 of the VEGP CSP is acceptable.

13.8.4.22 Cyber Security Program Review (Section A.4.3 of Appendix A to RG 5.71)

Section 4.3 of the VEGP CSP states that the applicant has established the necessary measures and governing procedures to implement periodic reviews of applicable program elements, in accordance with the requirements of 10 CFR 73.55(m). Specifically, the VEGP CSP calls for a review of the program's effectiveness at least every 24 months. In addition, reviews are to be conducted as follows:

- *within 12 months following initial implementation of the program*
- *as necessary, based upon site-specific analyses, assessments, or other performance indicators*
- *as soon as reasonably practical, but no longer than 12 months after changes occur in personnel, procedures, equipment, or facilities that potentially could adversely affect cyber security*
- *by individuals independent of those personnel responsible for program management, and any individual who has direct responsibility for implementing the program*

This deviates from RG 5.71 in the specific wording, but includes the same commitments. Specifically, RG 5.71 states that the licensee reviews the program's effectiveness at least every 24 months. In addition, reviews are conducted as follows:

- *within 12 months of the initial implementation of the program*
- *within 12 months of a change to personnel, procedures, equipment, or facilities that potentially could adversely affect security*

- *as necessary based upon site-specific analyses, assessments, or other performance indicators*

- *by individuals independent of those personnel responsible for program implementation and management*

Based on the above review, the NRC staff finds that the cyber security program review described in Section 4.3 of the VEGP CSP is acceptable.

13.8.4.23 Document Control and Records Retention and Handling (Section A.5 of Appendix A to RG 5.71)

Section 5 of the VEGP CSP states the necessary measures and governing procedures to ensure that sufficient records of items and activities affecting cyber security are developed, reviewed, approved, issued, used, and revised to reflect completed work. VEGP will retain records and supporting technical documentation required to satisfy the requirements of 10 CFR 73.54 and 10 CFR 73.55, "Requirements for Physical Protection of Licensed Activities in Nuclear Power Reactors against Radiological Sabotage," until the NRC terminates the facility's operating license. Records are retained to document access history, as well as to discover the source of cyber attacks or other security-related incidents affecting CDAs or SSEP functions, or both. VEGP Units 3 and 4 will retain superseded portions of these records for at least three years after the record is superseded, unless otherwise specified by the NRC.

This deviates from RG 5.71 by not specifically detailing the types of records, but instead describes that records will be retained to document access history and information needed to discover the source of cyber attacks and incidents. This is consistent with what is included in RG 5.71, Section 5, and includes all the performance-based characteristics and commitments of that section.

Based on the above review, the NRC staff finds that the document control and records retention handling described in Section 5 of the VEGP CSP is acceptable.

13.8.4.24 Deviations Taken to RG 5.71, Sections C.1 Through C.5

The VEGP CSP states that the plan deviates from Regulatory Positions C.1 through C.5 of RG 5.71, as noted in Attachment A to the CSP. It also deviates from Section A.1 of Appendix A of RG 5.71. For that reason, the staff considers that the full evaluation of the CSP must include a review of the deviations taken to those sections of RG 5.71 as listed in the VEGP CSP. This section of the SER lists those 69 specific deviations and their evaluated security impact. The following deviations were provided in a table, as part of Attachment A to the CSP.

13.8.4.24.1 RG 5.71, Section C.2, fourth paragraph, first sentence (page 8)

SNC added the term "adequately" to the phrase "…systems and equipment are protected from cyber attack." Since 10 CFR 73.54 specifically makes that same statement, the staff found no reason to object to that clarification. The objective is to provide adequate protection to the identified CDAs.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.2 RG 5.71, Section C.2, fourth paragraph, twelfth bullet, third sub-bullet (page 8)

SNC clarifies that its overall design is based on the Westinghouse AP1000 design and states that the AP1000 DCD commits to Revision 1 of RG 1.152, "Criteria for Digital Computers in Safety Systems of Nuclear Power Plants." Since the applicant is required to have a cyber security program that meets the performance objectives outlined in 10 CFR 73.54 and is not obliged to achieve that requirement exclusively through the example provided by RG 5.71, this clarification, in and of itself, was not considered by the staff as deviating from the requirements established by the rule.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.3 RG 5.71, Section C.2, fifteenth bullet (page 8)

The deviation states that the required policies and procedures have not yet been written, reviewed, and approved, and, thus, are not currently available for inspection and review.

The NRC requires that these policies and procedures be completed and available for review by the completion of the CSP implementation schedule proposed by the applicant, since CSP inspections would not occur until that time. The requirements of 10 CFR 73.55(a)(4) and proposed License Condition 6 provide the necessary controls associated with developing the required policies and procedures of the CSP.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.4 RG 5.71, Section C.3, Figure 1 (Page 10)

The deviation changes the arrows on the left side of Figure 1 from "Continuous Monitoring" to "Ongoing Monitoring."

The NRC intended monitoring to occur periodically, and when required, based on certain inputs into the process. SNC states that "continuous" might imply that monitoring was perpetual and not event driven. This was not the staff's intent with the term "continuous." The staff accepts the use of the term "ongoing" to better reflect the intent of this diagram.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.5 RG 5.71, Section C.3, third paragraph, first sentence (Page 10)

The VEGP CSP changes the statement, "An acceptable method to establish a cyber security program at a facility is by performing the following, (1) analyze the digital computer and communication systems and networks, …" to "An acceptable method to establish a cyber security program at a facility is by performing the following: (1) identify critical systems and critical digital assets as described in Section C.3.1.3, (2) analyze the digital computer and communication systems and networks..."

This deviation is acceptable because SNC proposes to use its licensing basis to identify CSs that are associated with SSEP functions, as 10 CFR 73.54 requires. This statement includes the first step in RG 5.71 to analyze digital computer and communication systems and networks to determine if they include CDAs.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.6 RG 5.71, Section C.3.1, first paragraph, first sentence (page 11)

The VEGP CSP changes the statement, "Consistent with the requirements of 10 CFR 73.54(b)(1), a licensee must conduct a site-specific analysis of digital computer and communication systems and networks to identify CDAs, which are those assets that, if compromised, could adversely impact the SSEP functions of nuclear facilities." to "Consistent with the requirements of 10 CFR 73.54(b)(1), a licensee must conduct a site-specific analysis of digital computer and communication systems and networks to identify CDAs, which are those assets that, if compromised, could adversely impact the CSs of nuclear facilities."

SNC defines a CS as:

> *An analog or digital technology-based system in or outside of the plant that performs or is associated with a safety-related, important-to-safety, security, or emergency preparedness function. These critical systems include, but are not limited to, plant systems, equipment, communication systems, networks, offsite communications, or support systems or equipment, that perform or are associated with a safety-related, important-to-safety, security, or emergency preparedness function as defined by the approved plant licensing basis.*

This definition ties CSs to SSEP functions; therefore, the change is consistent with the method used in RG 5.71, as this means that CSs are all those assets associated with SSEP functions, and, therefore, could adversely impact those SSEP functions.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.7 RG 5.71, Section C.3.1, first paragraph, second bullet (page 11)

The VEGP CSP includes a deviation to correct an editorial omission in RG 5.71. Page 11 of RG 5.71 states that:

An acceptable method for identifying and documenting CDAs is as follows:

- *obtain authorization for security assessment*
- *define roles and responsibilities cyber personnel and form the cyber security team*
- *identify and document CDAs at the facility*
- *review and validate configurations of CDAs*

The VEGP CSP corrects the second bullet to read:

- *define roles and responsibilities of cyber personnel and form the cyber security team*

This deviation which supplies the omitted "of" is consistent with the intent of the referenced bullet.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.8 RG 5.71, Section C.3.1.2, third paragraph, second bullet (page 13)

The VEGP CSP changes the second bullet on Page 13 of RG 5.71 from:

> *documenting all key observations, analyses, and findings during the assessment process so that this information can be used as a basis for applying security controls;*

to:

> *documenting all key observations, analyses, and findings during the assessment process so that this information can be used as a basis for addressing security controls;*

This deviation is acceptable because RG 5.71 allows a licensee to address, as opposed to apply, security controls if it follows the process in Appendix A, Section 3.1.6 of RG 5.71, which is to apply the control, apply an alternative that provides no less protection than the corresponding security control, or to demonstrate that the control is not necessary because the attack vector, root cause, or vulnerability associated with the control does not exist.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.9 RG 5.71, Section C.3.1.2, third paragraph, sixth bullet (page 13)

The VEGP CSP changes the sixth bullet on Page 13 from:

- *preparing documentation and overseeing implementation of the cyber security controls provided in Appendices B and C to this guide, documenting the basis for not implementing certain cyber security controls provided in Appendix B, or documenting the basis for the implementation of alternate or compensating measures in lieu of any cyber security controls provided in Appendix B; and*

to:

- *overseeing documentation and implementation of the cyber security controls provided in Appendices B and C to this guide, documenting the basis for not implementing certain cyber security controls provided in Appendix B and C, or documenting the basis for the implementation of alternate or compensating measures in lieu of any cyber security controls provided in Appendix B and C; and*

This deviation is acceptable because overseeing the documentation and implementation of security controls by qualified personnel is an approved method. Further, the extension of this method in Appendix C is also acceptable as the licensee has committed to follow the process in Appendix A, Section 3.1.6 of RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.10 RG 5.71, Section C.3.1.2, third paragraph, seventh bullet (page 13)

The VEGP CSP includes a deviation from RG 5.71 that changes bullet 7 from:

> *assuring the retention of all assessment documentation, including notes and supporting information, in accordance with 10 CFR 73.54(h) and the record retention and handling requirements specified in Section C.5 of this guide.*

to:

> *establishing the retention policy of all assessment documentation, including notes and supporting information, in accordance with 10 CFR 73.54(h) and the record retention and handling requirements specified in Section C.5 of this guide.*

This deviation is acceptable as the licensee has committed to establish the retention policy. Although this may be done by a different team, and not the CST, it is consistent with the intent of RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.11 RG 5.71, Section C.3.1.2, fourth paragraph, first sentence (page 13)

The VEGP CSP deviates from RG 5.71 by changing this sentence:

> *The licensee's CST needs to have the authority to conduct an objective assessment, make determinations that are not constrained by operational goals (e.g., cost),*

to:

> *The licensee's CST needs to have the authority to conduct an objective assessment, make determinations that are not constrained by business goals (e.g., cost),*

This deviation is acceptable because the intent of this statement in RG 5.71 is to ensure that cost is not used as a factor in making determinations about the adequacy of security controls, vulnerabilities, identifying CSs and CDAs, and carrying out other assessment functions of the CST.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.12 RG 5.71, Section C.3.1.3, second paragraph (page 14)

The VEGP CSP deviates from RG 5.71 by changing the identification process from CDAs to CSs. This deviation is acceptable because the VEGP CSP commits to continue identifying CSs by identifying digital computers, networks, communication systems and support systems that perform and are associated with SSEP functions, as well as support systems and equipment that, if compromised, would adversely impact the plant's SSEP functions.

This is consistent with the process in RG 5.71, which identifies CDAs through the same process. The licensee further describes CDAs as a CS or part of a CS; therefore, the use of the term CS as opposed to CDA is also consistent with the method used in RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.13 RG 5.71, Section C.3.1.3, fifth paragraph, first sentence (page 15)

The VEGP CSP deviates from RG 5.71 by making an editorial correction to RG 5.71. This involves changing:

> *With the identification of the all the CSs ...*

to:

> *With the identification of all the CSs ...*

This change is acceptable because it accomplishes the intent of this phrase in RG 5.71 eliminating the unnecessary "the."

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.14 RG 5.71, Section C.3.1.3, fifth paragraph, second sentence (page 15)

The VEGP CSP deviates from RG 5.71 by changing the following statement from:

> *A CDA may be a component of a CS ...*

to:

> *A CDA may be a complete CS or component of a CS, ...*

This deviation is acceptable because this statement is factually true. A CDA may be a complete CS and the deviation does not change the level of protection provided by the method outlined in RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.15 RG 5.71, Section C.3.1.3, fifth paragraph, fifth sentence (page 15)

The VEGP CSP deviates from RG 5.71 by including additional documentation to help identify CSs and CDAs. Specifically VEGP includes "other licensing basis" documents to identify CSs and CDAs.

This deviation is in line with the intent of using existing documentation to identify CSs and CDAs. This section of RG 5.71 describes "helpful information sources for identifying CSs and CDAs" and is not an exhaustive list, nor is it the only method SNC has committed to use to identify CSs and CDAs. Specifically, SNC has committed to identify all digital computers, networks and communication systems associated with SSEP functions, which is what 10 CFR 73.54 requires.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.16 RG 5.71, Section C.3.1.3, eighth paragraph, first bullet (page 16)

The VEGP CSP deviates from RG 5.71 by stating that CDAs may be an entire CS. As previously discussed in Section 13.8.4.24.14 of this SER, it is true that a CDA may be an entire CS; therefore, this definition does not adversely impact either the method used in RG 5.71 or the protection that RG 5.71 provides.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.17 RG 5.71, Section C.3.1.3, eighth paragraph, second bullet (page 16)

The VEGP CSP deviates from RG 5.71 by stating that CDAs may be an entire CS. As previously discussed in Sections 13.8.4.24.14 and 13.8.4.24.16 of this SER, it is true that a CDA may be an entire CS; therefore, this definition does not adversely impact either the method used in RG 5.71 or the protection that RG 5.71 provides.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.18 RG 5.71, Section C.3.2, first paragraph, first sentence (page 18)

The VEGP CSP deviates from RG 5.71 by providing an editorial correction to RG 5.71. Specifically, the VEGP CSP changes the following sentence from:

> *As stated in 10 CFR 73.54(c)(2), the licensee must design its cyber security program to apply and maintain integrate defense-in-depth protective strategies to ensure the capability to detect, prevent, respond to, mitigate, and recover from cyber attacks.*

to:

> *As stated in 10 CFR 73.54(c)(2), the licensee must design its cyber security program to apply and maintain integrated defense-in-depth protective strategies to ensure the capability to detect, prevent, respond to, mitigate, and recover from cyber attacks.*

This deviation captures the intent of this sentence in RG 5.71 by correcting "integrate" to "integrated."

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.19 RG 5.71, Section C.3.2, second paragraph, fourth sentence (page 18)

The VEGP CSP deviates from RG 5.71 by pointing to an editorial error in RG 5.71. Specifically, the VEGP CSP changes the following sentence from:

> *Therefore, defense-in-depth is achieved not only by implementing multiple security boundaries, but also by instituting and maintaining a robust program of security controls that assess, protect, respond, prevent, detect, and mitigates an attack on a CDA and with recovery.*

to:

> *Therefore, defense-in-depth is achieved not only by implementing multiple security boundaries, but also by instituting and maintaining a robust program of security controls that assess, protect, respond, prevent, detect, and mitigate an attack on a CDA and with recovery.*

This deviation captures the intent of this sentence in RG 5.71 by correcting "mitigates" to "mitigate." Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.20 RG 5.71, Section C.3.2, third paragraph, first sentence (page 18)

The VEGP CSP deviates from RG 5.71 by pointing to an editorial error in RG 5.71. Specifically, the VEGP CSP changes the following sentence from:

> *For example, if a failure in prevention were to occur (e.g., a violation of policy) or if protection mechanisms were to be bypassed (e.g., by a new virus that is not yet identified as a cyber attack), mechanisms would still in place to detect and respond to an unauthorized alteration in an impacted CDA, mitigate the impacts of this alteration, and recover normal operations of the impacted CDA before an adverse impact.*

to:

> *For example, if a failure in prevention were to occur (e.g., a violation of policy) or if protection mechanisms were to be bypassed (e.g., by a new virus that is not yet identified as a cyber attack), mechanisms would still be in place to detect and respond to an unauthorized alteration in an impacted CDA, mitigate the impacts of this alteration, and recover normal operations of the impacted CDA before an adverse impact.*

This is acceptable because the change to add the word "be" to the phrase "would still be in place to detect" captures the intent of this sentence by supplying the "be" omitted from RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.21 RG 5.71, Section C.3.2.1, Figure 5 (Page 19)

The VEGP CSP includes a defensive architecture, which deviates from the example provided in RG 5.71. The proposed architecture is acceptable because it provides defense-in-depth, communication isolation for safety and security systems, and multiple nondeterministic boundaries for nonsafety/nonsecurity CDAs. This provides adequate protection for CDAs and ensures that appropriate isolation and boundary protection exists for all CDAs where appropriate.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.22 RG 5.71, Section C.3.2.1, third paragraph (page 19)

The VEGP CSP deviates from RG 5.71 by modifying the characteristics of an acceptable defensive architecture by stating that the architecture includes CSs and CDAs configured in accordance with Section 5 of Appendix B, and Sections 6 and 7 of Appendix C in accordance with the security control application process described in Section 3.3. As previously discussed in Section 13.8.4.24.9 of this SER, the use of the security control application process to address controls is consistent with RG 5.71.

SNC has committed to apply the security control, demonstrate that alternative controls provide no less protection than the corresponding control, or demonstrate through analysis that the attack vector the control addresses does not exist; therefore, the control is not necessary.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.23 RG 5.71, Section C.3.2.1, third paragraph, first bullet (page 19)

The VEGP CSP deviates from RG 5.71 by modifying the example defensive architecture to match the architecture to be used in the AP1000. This deviation is acceptable because it provides the appropriate isolation of safety and security CDAs, and adequate boundaries for nonsafety/nonsecurity CDAs.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.24 RG 5.71, Section C.3.2.1, third paragraph, second bullet (page 19)

The VEGP CSP deviates from RG 5.71 by modifying the example defensive architecture to match the architecture to be used in the AP1000. As previously discussed in Section 13.8.4.6, this deviation is acceptable because it provides the appropriate isolation of safety and security CDAs, and adequate boundaries for nonsafety/nonsecurity CDAs. This is consistent with the defensive model in

RG 5.71, as the VEGP defensive architecture provides boundaries for safety systems that are deterministic.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.25 RG 5.71, Section C.3.2.1, third paragraph, third bullet (page 19)

The VEGP CSP deviates from RG 5.71 regarding communications from digital assets at lower security levels to digital assets at higher security levels. This deviation is acceptable because the defensive architecture prevents specific communication from lower security levels to specific higher security levels. This is consistent with the defensive model in RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.26 RG 5.71, Section C.3.2.1, third paragraph, new second bullet (page 19)

The VEGP CSP deviates from RG 5.71 regarding remote access. This is consistent with the guidance in Section C.7 of RG 5.71, which also states that remote access to CDAs at the highest level be prevented.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.27 RG 5.71, Section C.3.2.1, third paragraph, new sixth bullet (page 19)

The VEGP CSP deviates from RG 5.71 by including in its defensive architecture a statement from Section C.7 of RG 5.71 for validating data (software updates, new firmware, etc.) using a method at or above the level of security the CDA that will have data transferred to it. This concept is already acceptable in RG 5.71 and is also included in the defensive architecture, although in a different section of the document. This is consistent with the method used in RG 5.71 and does not adversely impact the protection provided.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.28 RG 5.71, Section C.3.2.1, third paragraph, seventh bullet (page 19)

The VEGP CSP deviates from RG 5.71 by changing the commitment to eliminate applications, services and protocols not necessary to support the design-basis function of the CDAs to eliminate, disable, or render these inoperable. This is consistent with the method in RG 5.71, because in some cases these elements cannot be eliminated, but rather may have to be disabled or otherwise rendered inoperable. In each case, the result is the same. The asset is only configured to perform its design-based function and nothing more, which produces no less protection than the method in RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.29 RG 5.71, Section C.3.2.1, third paragraph, eighth bullet (page 19)

The VEGP CSP deviates from RG 5.71 by eliminating the requirement to configure CDAs and boundary protection systems in accordance with Section 5 of Appendix B and Sections 6 and 7 of Appendix C. However, the VEGP CSP does commit to this in the preamble statement as described in Section 13.8.4.24.22 of this SER. Therefore, the VEGP CSP provides the same commitment to perform this as does RG 5.71, albeit in a different part of the same section.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.30 RG 5.71, Section C.3.2.1, fourth paragraph (page 19)

The VEGP CSP deviates from RG 5.71 by deleting the paragraph that commits to applying the security controls. However, the VEGP security plan commits, in Section 3.1.6, to address these controls and is, therefore, consistent with the method used in RG 5.71. The deleted paragraph is, therefore, unnecessary in the VEGP CSP to achieve the same commitment.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.31 RG 5.71, Section C.3.2.1, Prior to fifth paragraph (page 19)

The VEGP CSP deviates from the RG 5.71 defensive architecture. The VEGP architecture is described in Section 13.8.4.6 of this SER.

Based on the review and assessment in Section 13.8.4.6, the NRC staff finds that this deviation is acceptable.

13.8.4.24.32 RG 5.71, Section C.3.3, first paragraph, second sentence (page 20)

The VEGP CSP deviates from RG 5.71 by changing the following sentence:

> *A cyber compromise of CDAs would adversely impact nuclear facilities' SSEP functions that are necessary for protecting public health and safety.*

to:

> *A cyber compromise of CDAs could adversely impact nuclear facilities' SSEP functions that are necessary for protecting public health and safety.*

This deviation is consistent with the intent of RG 5.71, which implies that a compromise could lead to adverse impact and possible radiological sabotage. The intent of the paragraph is to establish the impact that could occur if a CDA were compromised. The security controls are designed around worst case scenarios, and the change in the VEGP CSP from "would" to "could" maintains this logic.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.33 RG 5.71, Section C.3.3, third paragraph, fourth sentence (page 20)

The VEGP CSP deviates from RG 5.71 by making an editorial correction to RG 5.71. This involves changing the statement:

> *Thus to provide high assurance that CDAs are protected from cyber attacks, potential cyber risks of these CDAs must be addressed known potential cyber risks.*

to:

> *Thus to provide high assurance that CDAs are protected from cyber attacks, potential cyber risks of these CDAs must be addressed for known potential cyber risks.*

This is acceptable because the change captures the intent of this sentence by supplying the "for" omitted from RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.34 RG 5.71, Section C.3.3, third paragraph, first sentence (page 20)

The VEGP CSP deviates from RG 5.71 by adding Appendix C to the list of controls that may be addressed using the method in Section 3.1.6 of Appendix A. This is consistent with the intent of RG 5.71, which assumes that all the controls in Appendix C can be implemented as written. However, if the controls can be addressed to demonstrate that an alternative control provides no less protection than the comparable control in Appendix C, or that the control is not necessary by demonstrating that the attack vector does not exist, this would meet the intent of RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.35 RG 5.71, Section C.3.3, third paragraph, first bullet (page 20)

The VEGP CSP deviates from RG 5.71 by adding Appendix C to the list of controls that may be addressed using the method in Section 3.1.6 of Appendix A. This is consistent with the intent of RG 5.71, which assumes that all the controls in Appendix C can be implemented as written. However, if the controls can be

addressed to demonstrate that an alternative control provides no less protection than the comparable control in Appendix C, or that the control is not necessary by demonstrating that the attack vector does not exist, this would meet the intent of RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.36 RG 5.71, Section C.3.3, third paragraph, second bullet (page 20)

The VEGP CSP deviates from RG 5.71 by stating that alternative controls will not provide equal or better protection to the corresponding control, but rather that they will not provide less protection than the corresponding control. This is consistent with the method used in RG 5.71; providing an alternative that does not provide less protection, and does not adversely impact the security program. Therefore, this change in commitment will provide an adequate level of protection and is consistent with the method used in RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.37 RG 5.71, Section C.3.3, third paragraph, second bullet, second sub-bullet (page 20)

The VEGP CSP deviates from RG 5.71 by changing the statement:

> *performing and documenting the attack vector and attack tree analyses of the CDA and alternative countermeasures to confirm that the countermeasures provide the same or greater protection as the corresponding security control in Appendix B.*

to:

> *performing and documenting an attack vector and attack tree analysis of the CDA and alternative countermeasures to confirm countermeasures provide no decrease in the effectiveness of protection as compared to the corresponding security control identified in Appendix B or C.*

This deviation is acceptable because whether the licensee performs a single analysis or multiple analyses, the method is comparable provided that it will demonstrate that there is no decrease in protection. Further, the modification of the second part of the sentence is also acceptable because the intent of this method in RG 5.71 is to ensure that alternative controls do not provide less protection than the corresponding control. Therefore, a commitment to ensure that alternatives do not provide less protection produces a comparable level of protection as stating that the alternatives provide equal or better protection. Finally, the addition of the Appendix C controls to this method is acceptable because the licensee has committed to apply the control, apply an alternative that provides no less protection than the comparable control or not to apply the control and demonstrate that the attack vector does not exist.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.38 RG 5.71, Section C.3.3, third paragraph, second bullet, third sub-bullet (page 20)

The VEGP CSP deviates from RG 5.71 in a similar manner to deviations in Section 13.8.4.24.37 of this SER by changing the commitment to implement alternative countermeasures that provide at least the same degree of protection as the corresponding security control in Appendix B, to implementing alternative controls to provide no decrease in the effectiveness of protection as compared to the corresponding security control identified in Appendices B and C of RG 5.71.

This method is consistent with the method in RG 5.71 as it also meets the criteria for the performance based characteristics of 10 CFR 73.54. As long as the implemented alternative control does not provide less protection than the corresponding control in RG 5.71, the intent of this section of RG 5.71 has been met. Alternative controls are considered to be adequate only if they provide equivalent protection, and the VEGP CSP commits to that minimum standard.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.39 RG 5.71, Section C.3.3, third paragraph, third bullet (page 20)

The VEGP CSP deviates from RG 5.71 by not stating that SNC will specifically perform an attack vector and attack tree analysis to demonstrate that one of the specific security controls is not necessary. SNC does commit to performing an analysis to demonstrate that the attack vector does not exist (i.e., is not applicable), thereby obviating the need for a specific security control.

This method is consistent with the method in RG 5.71 as it commits to demonstrating a conclusion, specifically, that the attack vector does not exist. If the licensee can demonstrate this, and not use an attack vector or attack tree analysis, the results are still the same and, therefore, the method would produce a result that does not provide less protection than the method in RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.40 RG 5.71, Section C.3.3, fourth paragraph, second sentence (page 20)

The VEGP CSP deviates from RG 5.71 by making an editorial correction to RG 5.71. This involves changing the statement:

> *When a security control is determined to have an adverse affect, alternate controls should be used by the licensee to protect the CDA from cyber attack up to and including the DBT consistent with the process described above.*

to:

> *When a security control is determined to have an adverse effect, alternate controls should be used by the licensee to protect the CDA from cyber attack up to and including the DBT consistent with the process described above.*

This is acceptable because the change captures the intent of this sentence in RG 5.71, by correcting "affect" to "effect."

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.41 RG 5.71, Section C.3.3, fifth paragraph, second sentence (page 21)

The VEGP CSP deviates from RG 5.71 by making an editorial correction to RG 5.71. This involves changing the statement:

> *If these effectiveness or vulnerability analyses identify a gap in the cyber security program, the licensee may need to implement additional security measures and controls not provided in Appendixes B and C.*

to:

> *If these effectiveness or vulnerability analyses identify a gap in the cyber security program, the licensee may need to implement additional security measures and controls not provided in Appendices B and C.*

This change is acceptable because it captures the intent of this sentence in RG 5.71, by correcting "Appendixes" to "Appendices."

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.42 RG 5.71, Sections C.3.3.1.1 through C.3.3.1.5, first paragraph and last bullet (pages 21 and 22)

The VEGP CSP deviates from RG 5.71 by stating that it will not apply all of the security controls in RG 5.71, but rather will address them. The VEGP CSP already commits to the RG 5.71 process, which is:

1) *applying controls;*

2) *applying an alternative control that does not provide less protection than the corresponding control; or*

3) *not applying a control, but demonstrating that the corresponding attack vector does not exist.*

The intent of RG 5.71 is to address the controls in Appendices B and C. This can be accomplished in accordance with Section 3.1.6 of Appendix A, to which SNC has committed.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.43 RG 5.71, Section C.3.3.1.1, first paragraph, second bullet, fourth sub-bullet (page 21)

The VEGP CSP deviates from RG 5.71 by committing to audit CDAs at an interval defined for the CDA, or within 5 days following revocation of an individual's unescorted access, due to a lack of trustworthiness or reliability, or as soon as reasonably practical upon changes in personnel. Although this method uses a different frequency than the method in RG 5.71, which calls for annual assessments, or assessments immediately upon changes in personnel, this frequency does meet the requirements of 10 CFR 73.55(m), which allows the licensee to define these intervals based on its own assessments of need.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.44 RG 5.71, Sections C.3.3.2.1 through C.3.3.2.5, first paragraph and last bullet (pages 23 and 24)

The VEGP CSP deviates from RG 5.71 in a fashion similar to the deviation cited in Section 13.8.4.24.42 of this SER by committing not to apply the controls, but rather to address them. As previously stated, this deviation is consistent with the method in RG 5.71, and also meets the intent of the RG, provided that the licensee follows the process in Section 3.1.6 of Appendix A, to which SNC has committed.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.45 RG 5.71, Sections C.3.3.2.6 through C.3.3.2.9, first paragraph and last bullet (pages 24-26)

The VEGP CSP deviates from RG 5.71 in a fashion similar to the deviation cited in Sections 13.8.4.24.42 and 13.8.4.24.44 of this SER by committing to apply the controls, but rather to address them. As previously stated, this deviation is consistent with the method in RG 5.71, and also meets the intent of the RG, provided that the licensee follows the process in Section 3.1.6 of Appendix A, to which SNC has committed.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.46 RG 5.71, Section C.3.3.2.9, first paragraph, first bullet (page 25)

The VEGP CSP deviates from RG 5.71 by making an editorial correction to RG 5.71. This involves changing the first bullet:

- *develop, disseminate, and annually review and update the configuration management policy and program which defines the purpose of the nuclear facility's configuration management policy, scope, roles, requirements, responsibilities, and management commitments necessary to provide, with high assurance, that (1) when a modification to a CDA does not reduce the existing security and (2) any unauthorized or inadvertent modification of a CDA is prevented.*

to:

- *develop, disseminate, and annually review and update the configuration management policy and program which defines the purpose of the nuclear facility's configuration management policy, scope, roles, requirements, responsibilities, and management commitments necessary to provide, with high assurance, that (1) a modification to a CDA does not reduce the existing security and (2) any unauthorized or inadvertent modification of a CDA is prevented.*

This is acceptable because it captures the intent of this sentence in RG 5.71, by striking the word "when" after "(1)." This editorial mistake will be corrected in a future revision.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.47 RG 5.71, Section C.3.3.3.1, first paragraph and last bullet (page 26)

The VEGP CSP deviates from RG 5.71 in a fashion similar to the deviations cited in Sections 13.8.4.24.42, 13.8.4.24.44 and 13.8.4.24.45 of this SER, and by committing not to apply the controls, but rather to address them. As previously stated, this deviation is consistent with the method in RG 5.71, and also meets the intent of RG 5.71, provided that the licensee follows the process in Section 3.1.6 of Appendix A, to which SNC has committed.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.48 RG 5.71, Section C.3.3.3.1, second paragraph (page 26)

The VEGP CSP deviates from RG 5.71 by committing to Revision 1 of RG 1.152 and not Revision 2 of RG 1.152 as stated in RG 5.71. The results of the NRC staff's technical evaluation of the digital instrumentation and controls design of the AP1000 are documented in Chapter 7 of NUREG-1793 and its supplements. SNC's use of the defensive architecture as discussed in Section 13.8.4.6 is acceptable to the staff.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.49 RG 5.71, Section C.3.3.3.2, first paragraph, second sentence (page 26)

The VEGP CSP deviates from RG 5.71 by committing to provide adequate protection of high assurance against cyber attacks. Although this commitment is worded differently than the commitment provided in RG 5.71, it does meet the requirement of 10 CFR 73.54(a), which states that licensees "shall provide high assurance that digital computer and communication systems and networks are adequately protected against cyber attacks, up to and including the design basis threat as described in 10 CFR 73.1."

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.50 RG 5.71, Section C.3.4, second paragraph, first sentence (page 26)

The VEGP CSP deviates from RG 5.71 as described in Section 13.8.4.8 of this SER by committing not to integrate management of physical and cyber security, but rather to provide the management interfaces necessary to appropriately coordinate the physical and cyber security activities. The VEGP CSP includes a commitment to establish an organization that is responsible for cyber security and is independent of operations. The combination of an independent organization responsible for cyber security, and management coordination between physical and cyber security meets the requirements of the rule and does not provide less protection than the method described in RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.51 RG 5.71, Section C.3.4, second paragraph, first bullet (page 27)

The VEGP CSP deviates from RG 5.71 as also described in Section 13.8.4.8 of this SER by committing not to form a unified security organization, but rather to establish a cyber security organization that is responsible for cyber security and is independent from operations. The combination of an independent organization responsible for cyber security, and management coordination as described in Section 13.8.4.24.50 of this SER between physical and cyber security meets the requirements of the rule, and does not provide less protection than the method described in RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.52 RG 5.71, Section C.4, first paragraph, first sentence (page 27)

The VEGP CSP deviates from RG 5.71 by changing the phrase:

> *Once the security program is in place...*

to:

> *Once the cyber security program is in place...*

This deviation is acceptable because the CSP only applies to the applicant's cyber security program.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.53 RG 5.71, Section C.4, first paragraph, first bullet (page 28)

The VEGP CSP deviates from RG 5.71 as previously described in Section 13.8.4.11 of this SER by changing the phrase "continuous monitoring and assessment" to "ongoing monitoring and assessment." This description is consistent with the method in RG 5.71 by establishing intervals for these assessments, which include the same elements as in RG 5.71, and meeting the periodicity requirements of 10 CFR 73.55(m).

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.54 RG 5.71, Section C.4.1, section heading and first paragraph, first sentence (page 28)

The VEGP CSP deviates from RG 5.71 as previously described in Sections 13.8.4.11 and 13.8.4.24.53 of this SER by changing the phrase "continuous monitoring and assessment" to "ongoing monitoring and assessment." This description is consistent with the method in RG 5.71 by establishing intervals for these assessments, which include the same elements in RG 5.71 and meeting the periodicity requirements of 10 CFR 73.55(m).

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.55 RG 5.71, Section C.4.1, second paragraph, first sentence (page 28)

The VEGP CSP deviates from RG 5.71 as previously described in Sections 13.8.4.11, 13.8.4.24.53 and 13.8.4.24.54 of this SER by changing the phrase "continuous monitoring and assessment" to "ongoing monitoring and assessment." This description is consistent with the method in RG 5.71 by establishing intervals for these assessments, which include the same elements as in RG 5.71 and meeting the periodicity requirements of 10 CFR 73.55(m).

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.56 RG 5.71, Section C.4.1, second paragraph, first bullet (page 28)

The VEGP CSP deviates from RG 5.71 by making an editorial correction to RG 5.71. This involves changing the phrase:

> *ongoing assessments of verify that the security controls...*

to:

> *ongoing assessments to verify that the security controls...*

This change is acceptable because it captures the intent of this sentence in RG 5.71, by substituting "to" for "of."

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.57 RG 5.71, Section C.4.1, third paragraph, first and second sentences (page 28)

The VEGP CSP deviates from RG 5.71 as previously described in Sections 13.8.4.11, 13.8.24.53, 13.8.4.24.54 and 13.8.4.24.55 of this SER by changing the phrase "continuous monitoring and assessment" to "ongoing monitoring and assessment." This description is consistent with the method in RG 5.71 by establishing intervals for these assessments, which include the same elements as in RG 5.71, and meeting the periodicity requirements of 10 CFR 73.55(m).

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.58 RG 5.71, Section C.4.1.1, first paragraph, second sentence (page 28)

Section 3.1.1 of the VEGP CSP states that status of security controls will be verified in accordance with the requirements of 10 CFR 73.55(m).

The NRC staff reviewed the above and found that reviewing security controls in accordance with 10 CFR 73.55(m) is in accordance with RG 5.71. The time period between evaluations may be longer than the time period provided in RG 5.71. However, this period cannot exceed 24 months, which conforms to 10 CFR 73.54(g), requiring the applicant to review the cyber security program as a component of the physical security program in accordance with the requirements of 10 CFR 73.55(m), including the periodicity requirements. The requirements of 10 CFR 73.55(m) are that, at minimum, the applicant review each element of the physical protection program at least every 24 months.

The licensee has also committed to address C.13 of Appendix C to RG 5.71, "Security Assessment and Risk Management," which calls for vulnerability assessments on a quarterly basis. SNC commits to apply this control, apply an alternative that provides no less protection than C.13, or demonstrate that any attack vectors associated with vulnerabilities that may be discovered through quarterly assessments do not exist. The VEGP CSP also includes addressing controls that specifically include defined verification periods and that detect when some controls are not working correctly.

This, coupled with the CSP conforming to requirements of 10 CFR 73.55(m), which includes an initial assessment within 12 months of the program inception, and as necessary based on site-specific analyses, assessments, or other performance indicators, provides a level of protection consistent with the method in RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.59 RG 5.71, Section C.4.1.2, first paragraph, third sentence (page 29)

Section 3.1.1 of the VEGP CSP states that effectiveness of security controls will be verified in accordance with the requirements of 10 CFR 73.55(m). As previously discussed in Section 13.8.4.12 of this SER, the NRC staff reviewed the above and found that the period of effectiveness analysis is comparable with that of RG 5.71.

The time period between evaluations is 12 months longer than the time period provided in RG 5.71. However, this 24-month time period conforms to 10 CFR 73.54(g) requiring the applicant to review the cyber security program as a component of the physical security program in accordance with the requirements of 10 CFR 73.55(m), including the periodicity requirements. The requirements of 10 CFR 73.55(m) are that, at minimum, the applicant review each element of the physical protection program, which includes the cyber security program, at least every 24 months and within 12 months of the implementation of the program, or within 12 months when changes that may adversely impact the security program occur.

Furthermore, the VEGP CSP states that controls will be reviewed according to the requirements of the security controls if that period of review occurs more often. This is also consistent with the method provided in RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.60 RG 5.71, Section C.4.1.3, first paragraph, second sentence (page 29)

VEGP CSP Section 4.1.3 deviates from RG 5.71 by stating that vulnerability assessments will occur periodically. RG 5.71, Section C.4.1.3 states that vulnerability assessments will occur no less frequently than on a quarterly basis.

As previously described in Section 13.8.4.14 of this SER, the VEGP CSP states vulnerability assessments will be performed as specified in the security controls in Appendices B and C of RG 5.71, and when new vulnerabilities that could affect the effectiveness of the cyber security program and the security of the CDAs are identified. The licensee also commits to addressing vulnerabilities that could cause CDAs to become compromised or could have an adverse impact on SSEP functions. Section 13.1 of Appendix C of RG 5.71, which VEGP commits to address in accordance with the process in Section 3.1.6 of Appendix A, provides that vulnerability assessments should occur no less frequently than once a quarter, at random intervals, and when new potential vulnerabilities are reported and identified. SNC has not deviated from the interval.

The process the applicant has committed to in Section 3.1.6 of the VEGP CSP requires SNC, if it does not implement Section 13.1 of Appendix C, to implement an alternate control that does not provide less protection than the corresponding control in Appendices B and C, or to demonstrate that any attack vectors associated with vulnerabilities that may be discovered through quarterly assessments do not exist.

Therefore, if SNC does not implement the security control in Appendix C, Section 13.1 of RG 5.71, or deviates from the guidance for a quarterly vulnerability assessment, it will ensure that this deviation does not provide less protection than performing quarterly vulnerability assessments, and will provide an analysis that demonstrates that the attack vector does not exist and will document this justification for inspection.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.61 RG 5.71, Section C.4.2, first paragraph, second sentence (page 30)

The VEGP CSP deviates from RG 5.71 by committing not to implement the security controls in Section 11 of Appendix C of RG 5.71, but rather to address those controls in accordance with Section C.3.3 of RG 5.71.

As previously described in Section 13.8.4.7 of this SER, the VEGP CSP deviates from RG 5.71 by committing to address security controls rather than committing to apply them. The VEGP CSP states that when a control from Appendices B and C of RG 5.71, such as Section 11 of Appendix C, is not implemented that the licensee will implement alternate control(s) that "do not provide less protection that the corresponding" control in the appendix. This deviation is consistent with the method used in RG 5.71, which states that controls should provide equal or better protection.

As also previously discussed in Section 13.8.4.7 of this SER, the VEGP CSP deviates from RG 5.71 by stating that when a control can be proven to be unnecessary, the applicant will perform an analysis demonstrating that the control is not necessary, and will provide a documented justification. Therefore, SNC commits that in addressing the security controls in Appendix C, Section 11 of RG 5.71 that it will either apply the control, apply an alternative that does not

provide less protection or will demonstrate that the control is not necessary because the attack vectors do not exist. This method is consistent with the method used in RG 5.71, which also allows for controls to be addressed.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.62 RG 5.71, Section C.4.2.1, first paragraph, third sentence (page 30)

The VEGP CSP deviates from RG 5.71 in a manner similar to the previous deviation in Section 13.8.4.24.61 of this SER. Specifically, that configuration management will be used to ensure that each of the controls is addressed in Appendices B and C of RG 5.71, as opposed to implemented. This method is consistent with the method in RG 5.71, as the applicant commits to follow the process in Section C.3.3 of RG 5.71, which requires that the applicant implement the control, apply an alternative control that does not provide less protection than the corresponding control in RG 5.71, or demonstrate that the attack vector associated with the control does not exist. Therefore, the VEGP CSP method will provide no less protection than the method provided for in RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.63 RG 5.71, Section C.4.2.1, second paragraph, third sentence (page 30)

The VEGP CSP deviates from RG 5.71 by including the statement, "in accordance with the process described in Section C.3.3 of this guide." As previously discussed in Section 13.8.4.14 of this SER, the method in Section C.3.3 is consistent with the method in RG 5.71, which requires that the licensee either implement the control, apply an alternative control that does not provide less protection than the corresponding control in RG 5.71, or demonstrate that the attack vector associated with the control does not exist. Therefore, the VEGP CSP method will provide no less protection than the method provided for in RG 5.71.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.64 RG 5.71, Section C.4.3, second paragraph (page 31)

The VEGP CSP deviates from RG 5.71, as previously discussed in Section 13.8.4.22 of this SER, by stating that the applicant has established the necessary measures and governing procedures to implement periodic reviews of applicable program elements, in accordance with the requirements of 10 CFR 73.55(m). Specifically, the VEGP CSP calls for a review of the program's effectiveness at least every 24 months. In addition, reviews are to be conducted as follows:

- *within 12 months following initial implementation of the program*

- *as necessary based upon site-specific analyses, assessments, or other performance indicators*

- *as soon as reasonably practical, but no longer than 12 months, after changes occur in personnel, procedures, equipment, or facilities that potentially could adversely affect cyber security*

- *by individuals independent of those personnel responsible for program management and any individual who has direct responsibility for implementing the program*

This deviates from RG 5.71 in the specific wording, but includes the same commitments as RG 5.71. Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.65 RG 5.71, Section C.5, second paragraph, second and third sentences (page 32)

As previously discussed in Section 13.8.4.23, the VEGP CSP deviates from RG 5.71 documentation retention commitments. Specifically, VEGP CSP Section 5 states the records are retained to document access history and information needed to discover the source of cyber attacks and incidents. The VEGP CSP deletes the phrase:

> *Records required for retention include, but are not limited to, digital records, log files, audit files, and nondigital records that capture, record, and analyze network and CDA events.*

The VEGP CSP commits to retaining all access history records, records to discover the source of cyber attacks or other security-related incidents affecting CDAs or SSEP functions, or both. This is consistent with what is included in RG 5.71 Section 5, as it includes all the performance-based characteristics and commitments of that section.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.66 RG 5.71, Glossary (Page 35)

The VEGP CSP's definition of a CDA deviates from the definition provided in RG 5.71. Specifically, the VEGP CSP deviates by stating that a CDA can be a CS or a subcomponent of a CS. This definition does not materially change the use of the term, and is correct: A CDA can be a CS. This definition is consistent with the definition in RG 5.71. The VEGP CSP, by the use of this definition, does not provide for less protection than RG 5.71, nor does this reduce the scope of the assets required to be protected under the rule.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.67 RG 5.71, Glossary (Page 35)

The VEGP CSP deviates from the definition of a CS in RG 5.71 by adding the caveat "as defined by the plant licensing basis." RG 5.71 states that a CS is an analog or digital technology based system in or outside the plant that performs or is associated with a safety-related, important-to-safety, security, or emergency preparedness function. These CSs include, but are not limited to, plant systems, equipment, communication systems, networks, offsite communications, or support systems or equipment, that perform or are associated with safety-related, important-to-safety, security, or emergency preparedness functions.

The addition of the phrase "as defined by the plants' licensing basis," limits the scope of the functions to those that are defined by the licensing basis. As previously discussed in Section 13.8.4.4 of this SER, the staff ~~was concerned that this modifier might cause the licensee to exclude CSs, which ought to be included, according to the rule~~ [found this modification acceptable]*.*
10 CFR 73.51(a)(1) requires that the licensee protect digital computer and communication systems and networks associated with: (i) safety-related and important-to-safety functions; (ii) security functions; (iii) emergency preparedness functions, including offsite communications; and (iv) support systems and equipment, which if compromised would adversely impact SSEP functions. However, further reviews resulted in the staff finding that the VEGP CSP scoping discussion adequately described a process to include all CDAs within the scope of 10 CFR 73.54(a)(1).

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.68 RG 5.71, Glossary (Page 35)

The VEGP CSP deviates from the RG 5.71 definition of cyber attack by replacing the phrase "conducted by threat agents having either malicious or non-malicious intent" with the phrase "conducted by threat agents." The NRC staff finds this deviation to be acceptable because deletion of the intent of a threat agent, be it malicious or non-malicious, still provides a commitment to protect against threats by threat agents.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

13.8.4.24.69 RG 5.71, Appendix A, Introduction (Page A-1)

The VEGP CSP deviates from the RG 5.71 scope discussion by including within scope systems or equipment that perform important to safety functions SSCs in the BOP that could directly or indirectly affect reactivity at a nuclear power plant and could result in an unplanned reactor shutdown or transient. Additionally, these SSCs are under the licensee's control and include electrical distribution equipment out to the first inter-tie with the offsite distribution system. The NRC

staff finds this deviation to be acceptable because it is consistent with Commission policy.

Based on the above review and assessment, the NRC staff finds that this deviation is acceptable.

License Conditions

- *Part 10, License Condition 2, COL Item 13.6-5 and License Condition 3, Item G.10*

The applicant proposed two license conditions in Part 10 of the VEGP COL application, which will require the applicant to implement the cyber security program prior to initial fuel load.

In a letter dated October 22, 2010, the applicant provided supplemental information which proposed to amend the milestone included in Part 2, FSAR Table 13.4-201 to implement the cyber security program prior to receipt of fuel onsite (protected area.) The NRC staff finds the proposed implementation milestone for the cyber security program (security prior to receipt of fuel onsite (protected area)) appropriate and in accordance with the requirement in 10 CFR 73.55(a)(4). Therefore the staff finds that the proposed License Conditions 2 and 3 are not necessary.

- *Part 10, License Condition 6*

The applicant proposed a license condition in Part 10 of the VEGP COL application to provide a schedule to support the NRC's inspection of operational programs, including the cyber security program. Although the CSP is not identified as an operational program in SECY-05-0197, the proposed license condition is consistent with the policy established in SECY-05-0197 for operational programs in general, and is acceptable.

VCSNS Clarifying Information Regarding License Condition 2, COL Item 13.6-5

VCSNS COL application, Part 10, Revision 2 did not include License Condition 2, COL Item 13.6-5 regarding CSP. Therefore, the discussion above regarding removal of this license condition is not applicable to VCSNS.

13.8.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff finds the following license condition proposed by the applicant acceptable:

- License Condition (13-7) - No later than 12 months after issuance of the COL, the licensee shall submit to the Director of NRO a schedule that supports planning for and conduct of NRC inspection of the cyber security program implementation. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the cyber security program has been fully implemented.

13.8.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to cyber security, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The NRC staff has reviewed the CSP for format and content using the NRC CSP template in RG 5.71, and found it to include all features considered essential to such a program. In particular the staff has found it to comply with applicable Commission regulations including 10 CFR 73.1, 10 CFR 73.54, 10 CFR 73.55(a)(1), 10 CFR 73.55(b)(8), 10 CFR 73.55(m), and 10 CFR Part 73, Appendix G.

Table 13.3-1. Emergency Plan ITAAC

Planning Standard	EP Program Elements	Inspections, Tests, Analyses	Acceptance Criteria
1.0 Emergency Classification System			
10 CFR 50.47(b)(4) — A standard emergency classification and action level scheme, the bases of which include facility system and effluent parameters, is in use by the nuclear facility licensee, and State and local response plans call for reliance on information provided by facility licensees for determinations of minimum initial offsite response measures.	1.1 A standard emergency classification and emergency action level (EAL) scheme exists, and identifies facility system and effluent parameters constituting the bases for the classification scheme. [D.1**] [**D.1 corresponds to NUREG-0654/FEMA-REP-1 evaluation criteria.]	1.1 An inspection of the Control Room, Technical Support Center (TSC), and Emergency Operations Facility (EOF) will be performed to verify that they have displays for retrieving facility system and effluent parameters that are specified in the Emergency Classification and EAL scheme and the displays are functional.	1.1 The specified parameters, as listed in AP1000 DCD Table 7.5.1 and FSAR Table 7.5-201, are retrievable in the Control Room, TSC and EOF, and the ranges of the displays encompass the values specified in the Emergency Classification and EAL Technical Basis Document.
2.0 Notification Methods and Procedures			
10 CFR 50.47(b)(5) — Procedures have been established for notification, by the licensee, of State and local response organizations and for notification of emergency personnel by all organizations; the content of initial and follow-up messages to response organizations and the public has been established; and means to provide early notification and clear instruction to the populace within the plume exposure pathway Emergency Planning Zone have been established.	2.1 The means exists to notify responsible State and local organizations within 15 minutes after the licensee declares an emergency. [E.1] 2.2 The means exists to notify emergency response personnel. [E.2]	2.1. A test of the ESSX line will be performed to demonstrate the capabilities for providing initial notification to the offsite authorities after a simulated emergency classification. 2.2 A test of the primary and back-up ERO notification systems will be performed.	2.1 Using the ESSX line the State of South Carolina and the counties of Fairfield, Lexington, Newberry and Richland received notification within 15 minutes after the declaration of an emergency from the Control Room and the EOF. A test of each facility ESSX line was successful using the standard South Carolina notification form. 2.2 Emergency response personnel received the notification message and mobilization communication was validated by personnel response to the notification system and by telephone during off-hours. Also demonstrated work hours electronic notification and plant page system during working hours.

Planning Standard	EP Program Elements	Inspections, Tests, Analyses	Acceptance Criteria
2.0 Notification Methods and Procedures (continued)			
	2.3 The means exists to notify and provide instructions to the populace within the plume exposure EPZ. [E.6]	2.3 The full test of the ANS capabilities will be conducted.	2.3 The ANS was demonstrated to notify and provide instructions to the public and was demonstrated to meet the design objectives, as stated in the emergency plan.
3.0 Emergency Communications			
10 CFR 50.47(b)(6) — Provisions exist for prompt communications among principal response organizations to emergency personnel and to the public.	3.1 The means exists for communications among the Control Room, TSC, EOF, principal State and local emergency operations centers (EOCs), and radiological field assessment teams. [F.1.d]	3.1 A test will be performed of the capabilities. The test for the contact with the principal EOCs and the radiological field assessment teams will be from the Control Room and the EOF. See also ITA 5.1.1.	3.1 Communications (both primary and secondary methods/systems) were established among the Control Room and the EOF with the South Carolina Emergency Management Division (SCEMD) warning point and EOC; Fairfield County Warning Point and EOC; Richland County Warning Point and EOC; Newberry County Warning Point and EOC; and Lexington County Warning Point and EOC. Communications were established between the Control Room and the EOF with the VCSNS radiological field monitoring teams. See also AC 5.1.4.

Planning Standard	EP Program Elements	Inspections, Tests, Analyses	Acceptance Criteria
3.0 Emergency Communications (continued)			
	3.2 The means exists for communications from the Control Room, TSC, and EOF to the NRC headquarters and regional office EOCs (including establishment of the Emergency Response Data System (ERDS) [or its successor system] between the onsite computer system and the NRC Operations Center.) [F.1.f]	3.2 A test is performed of the capabilities to communicate using ENS from the Control Room, TSC and EOF to the NRC headquarters and regional office EOCs. HPN is tested to ensure communications between the TSC and EOF with the NRC Operations Center. ERDS is established [or its successor system] between the onsite computer systems and the NRC Operations Center.	3.2 Communication was established from the Control Room, TSC and EOF to the NRC headquarters and regional office EOCs utilizing the ENS. The TSC and EOF demonstrated communications with the NRC Operations Center using HPN. The access port for ERDS [or its successor system] successfully completed a transfer of data to the NRC Operations Center.
4.0 Public Education and Information			
10 CFR 50.47(b)(7) — Information is made available to the public on a periodic basis on how they will be notified and what their initial actions should be in an emergency (e.g., listening to a local broadcast station and remaining indoors), the principal points of contact with the news media for dissemination of information during an emergency (including the physical location or locations) are established in advance, and procedures for coordinated dissemination of information to the public are established.	4.1 The licensee has provided space which may be used for a limited number of the news media. [G.3.b]	4.1 An inspection of the facility/area provided for the news media will be performed in the Joint Information Center (JIC). The space provides adequate equipment to support JIC operation, including communications with the site and with the Emergency Operation Centers in the state and counties as well as a limited number of news media.	4.1 The licensee has provided space which may be used for a limited number of the news media in the Joint Information Center. This space provides the needed equipment per approved administrative procedures.

Planning Standard	EP Program Elements	Inspections, Tests, Analyses	Acceptance Criteria
5.0 Emergency Facilities and Equipment			
10 CFR 50.47(b)(8) — Adequate emergency facilities and equipment to support the emergency response are provided and maintained.	5.1 The licensee has established a TSC and onsite OSC. [H.1, H.9]	5.1.1 An inspection of the TSC and OSC will be performed, including a test of the capabilities. These facilities will meet the criteria of NUREG-0696 with exceptions.	5.1.1 The TSC has at least 3,000 square feet of floor space 5.1.2 The TSC is located outside the Protected Area and advanced communication capabilities are available and utilized to ensure communications between the emergency response facilities. Procedures are in place to enhance passage through security checkpoints expeditiously. 5.1.3 The TSC ventilation system includes a high efficiency particulate air (HEPA) and charcoal filter and radiation monitors are installed. 5.1.4 TSC communications equipment is installed per specifications and is operable. Communications have been initiated and found to be acceptable in giving and receiving voice communications with the Control Room, the OSC and the EOF. 5.1.5 The TSC has the means to receive, store, process, and display plant and environmental information, as listed in AP1000 DCD Table 7.5.1 and FSAR Table 7.5-201, and to initiate emergency measures and conduct emergency assessment. 5.1.6 There is an OSC located inside the Unit. It is separate from the Control Room and within the Protected Area. 5.1.7 OSC communications equipment is installed, and voice transmission and reception have been demonstrated between the OSC, OSC Teams, the TSC, and Control Room. 5.1.8 A reliable and backup electrical supply is available for the TSC
	5.2 The licensee has established an EOF. [H.2]	5.2 An inspection of the EOF will be performed, including a test of the capabilities. The EOF is located outside of the	5.2.1 The EOF working space size is consistent with NUREG-0696 (75 ft2/ person), and is large enough for required systems, equipment, records and storage.

Planning Standard	EP Program Elements	Inspections, Tests, Analyses	Acceptance Criteria
		10 mile Emergency Planning Zone.	5.2.2 The EOF habitability is consistent with Table 2 of NUREG-0696. • Distance at or beyond 10 mi of the TSC • Built to meet the criteria of the County Building Code 5.2.3 EOF communications equipment is installed, and voice transmission and reception are accomplished with the Control Room, TSC, radiological monitoring teams, NRC, state and county agencies using typical data generated during facility activation. 5.2.4 Radiological data identified in the EP Unit Annex, meteorological data, and plant system data pertinent to determining offsite protective measures, as listed in AP1000 DCD Table 7.5.1 and FSAR Table 7.5-201, are available and displayed when activated in the EOF
6.0 Accident Assessment			
10 CFR 50.47(b)(9) — Adequate methods, systems, and equipment for assessing and monitoring actual or potential offsite consequences of a radiological emergency condition are in use.	6.1 The means exists to provide initial and continuing radiological assessment throughout the course of an accident. [I.2]	6.1 A test will be performed to demonstrate that the means exist to provide initial and continuing radiological assessment throughout the course of an accident through the plant computer or communications with the Control Room.	6.1 The means exist to provide initial and continuing radiological assessment through displays of instrumentation indicators in the Control Room, TSC and EOF during the course of drills and/or exercises.
	6.2 The means exists to determine the source term of releases of radioactive material within plant systems, and the magnitude of the release of	6.2 A test will be performed to demonstrate that the means exist to determine the source term of releases of radioactive material within	6.2 Emergency Planning Implementing Procedures, through use in training and a drill, provided direction to accurately calculate the source terms and the magnitude of the release of postulated accident scenario releases.

Planning Standard	EP Program Elements	Inspections, Tests, Analyses	Acceptance Criteria
	radioactive materials based on plant system parameters and effluent monitors. [I.3]	plant systems, and the magnitude of the release of radioactive materials based on plant system parameters and effluent monitors.	
	6.3 The means exists to continuously assess the impact of the release of radioactive materials to the environment, accounting for the relationship between effluent monitor readings, and onsite and offsite exposures and contamination for various meteorological conditions. [I.4]	6.3 A test will be performed to demonstrate that the impact of a radiological release to the environment is able to be assessed by utilizing the relationship between effluent monitor readings, and onsite and offsite exposures and contamination for various meteorological conditions.	6.3 Response personnel demonstrated that the means exist to continuously assess the impact of the release of radioactive materials to the environment, accounting for the relationship between effluent monitor readings, and onsite and offsite exposures and contamination for various meteorological conditions under drill conditions.
	6.4 The means exists to acquire and evaluate meteorological information. [I.5]	6.4 A test will be performed to acquire and evaluate meteorological data/information.	6.4 Meteorological data was available at the EOF, TSC, Control Room, offsite NRC Operations Center, and the state of South Carolina. This data was in the format needed for the appropriate emergency planning implementing procedures.
	6.5 The means exists to make rapid assessments of actual or potential magnitude and locations of radiological hazards through liquid or gaseous release pathways, including activation, notification means, field team composition, transportation, communication, monitoring equipment, and estimated deployment times. [I.8]	6.5 A test will be performed of the capabilities to make rapid assessments of actual or potential magnitude and locations of radiological hazards through liquid or gaseous release pathways, including activation, notification means, field team composition, transportation, communication, monitoring equipment, and estimated deployment times.	6.5 The field monitoring team(s) was activated and evaluated. They demonstrated an ability to make rapid assessment of actual or potential magnitude and locations of any radiological hazards through simulated liquid or gaseous release pathways. A qualified field team was notified, activated, briefed and dispatched from the EOF during a radiological release scenario. The team demonstrated the procedural guidance in team composition, use of monitoring equipment, communication from the field, and locating specific sampling locations.
	6.6 The capability exists to detect and measure radioiodine concentrations in air in the plume exposure EPZ, as low as 10-7 µCi/cc (microcuries per cubic centimeter) under field conditions. [I.9]	6.6 A test will be performed of the capabilities to detect and measure radioiodine concentrations in air in the plume exposure EPZ, as low as 10-7 µCi/cc (microcuries per cubic centimeter) under	6.6 A field monitoring team was dispatched during a radiological release scenario and demonstrated the use of sampling and detection equipment for air concentrations in the plume exposure EPZ, as low as 10-7 µCi/cc.

Planning Standard	EP Program Elements	Inspections, Tests, Analyses	Acceptance Criteria
		field conditions.	
	6.7 The means exists to estimate integrated dose from the projected and actual dose rates, and for comparing these estimates with the EPA protective action guides (PAGs). [I.10]	6.7 A test will be performed of the capabilities to estimate integrated dose from the projected and actual dose rates, and for comparing these estimates with the EPA protective action guides.	6.7 The means were demonstrated to estimate integrated dose from the dose assessment program and the field monitoring team reading during a radioactive release scenario. The results were compared with the EPA PAGs.
7.0 Protective Response			
10 CFR 50.47(b)(10) — A range of protective actions has been developed for the plume exposure EPZ for emergency workers and the public. In developing this range of actions, consideration has been given to evacuation, sheltering, and, as a supplement to these, the prophylactic use of potassium iodide (KI), as appropriate. Guidelines for the choice of protective actions during an emergency, consistent with Federal guidance, are developed and in place, and protective actions for the ingestion exposure EPZ appropriate to the locale have been developed.	7.1 The means exists to warn and advise onsite individuals of an emergency, including those in areas controlled by the operator, including: [J.1] 1. employees not having emergency assignments; 2. visitors; 3. contractor and construction personnel; and 4. other persons who may be in the public access areas, on or passing through the site, or within the owner controlled area.	7.1 A test will be performed of the capabilities to warn and advise onsite individuals of an emergency, including those in areas controlled by the operator.	7.1 The means exist and was successfully demonstrated to warn and advise onsite individuals including: 1. non-essential employees; 2. visitors; 3. contractor and construction personnel; and 4. other personnel within the owner controlled area.

Planning Standard	EP Program Elements	Inspections, Tests, Analyses	Acceptance Criteria
8.0 Exercises and Drills			
10 CFR 50.47(b)(14) – Periodic exercises are (will be) conducted to evaluate major portions of emergency response capabilities, periodic drills are (will be) conducted to develop and maintain key skills, and deficiencies identified as a result of	8.1 Licensee conducts a full participation exercise to evaluate major portions of emergency response capabilities, which includes participation by each state and local agency within the plume exposure EPZ, and each state within the ingestion control	8.1 A full participation exercise (test) will be conducted within the specified time periods of Appendix E to 10 CFR Part 50.	8.1.1 The exercise was completed within the specified time periods of Appendix E to 10 CFR Part 50, onsite exercise objectives were met, including: A. *Accident Assessment and Classification* 1. Demonstrate the ability to identify initiating conditions, determine emergency action levels (EAL) parameters, and correctly

Planning Standard	EP Program Elements	Inspections, Tests, Analyses	Acceptance Criteria
exercises or drills are (will be) corrected.	EPZ. [N.1]		classify the emergency throughout the exercise. Standard Criteria: a. Determine the correct emergency classification level based on events which were in progress, considering past events and their impact on the current conditions within 15 minutes from the time the initiating condition(s) or EAL is exceeded during the exercise. B. *Notifications* 1. Demonstrate the ability notify responsible state and local government agencies within 15 minutes and the NRC within 60 minutes after declaring an emergency. Standard Criteria: a. Accurately transmit information in accordance with Emergency Plan Implementing Procedures within 15 minutes of the emergency declaration. 2. Demonstrate the ability to alert, notify, and mobilize site emergency response personnel during the exercise. Standard Criteria: a. Complete the designated actions in accordance with Emergency Plan Implementing Procedures and perform the announcement concerning the initial event classification of Alert or higher during the exercise. b. Mobilize site emergency responders in accordance with Emergency Plan implementing Procedures at the initial event classification for an Alert or higher during the exercise. 3. Demonstrate the ability to warn or advise onsite individuals of emergency conditions.

Planning Standard	EP Program Elements	Inspections, Tests, Analyses	Acceptance Criteria
			Standard Criteria: a. Initiate notification of onsite protective actions. 4. Demonstrate the capability of the Alert and Notification System (ANS) to operate properly when required. Standard Criteria: a. 90% of the sirens operate properly, as indicated by the feedback system. *C. Emergency Response* 1. Demonstrate the ability to direct and control emergency operations. Standard Criteria a. Command and control is demonstrated by the Control Room (simulator) in the early phase of the emergency and by the Technical Support Center (TSC) and Emergency Operations Facility (EOF) within 75 minutes of the emergency declaration. 2. Demonstrate the ability to transfer emergency direction from the Control Room (simulator) to the EOF. Standard Criteria: a. Turnover briefings are conducted in accordance with Emergency Plan Implementing Procedures. 3. Demonstrate the ability to prepare for around-the-clock staffing requirements. Standard Criteria a. Complete 24-hour staffing assignments. 4. Demonstrate the ability to perform assembly and accountability for personnel in the Protected Area within 30 minutes of the

Planning Standard	EP Program Elements	Inspections, Tests, Analyses	Acceptance Criteria
			declaration of a Site Area Emergency or higher classification. Standard Criteria: a. Protected Area personnel assembly and accountability completed within 30 minutes of the declaration of a Site Area Emergency or higher classification. D. *Emergency Response Facilities* 1. Demonstrate activation of the Operational Support Center (OSC), and full functional operation of the TSC and EOF within 75 minutes of a declaration of Alert or higher emergency classification. Standard Criteria: a. The TSC, OSC, and EOF are activated within 75 minutes of the declaration of an Alert of higher emergency classification. 2. Demonstrate the adequacy of equipment, security provisions, and habitability precautions for the TSC, OSC, and EOF, as appropriate. Standard Criteria a. Demonstrate the adequacy of the emergency equipment in the emergency response facilities as specified in Emergency Plan Implementing Procedures, as appropriate. b. The security force implements and follows applicable security plan procedures as appropriate during the exercise. c. Demonstrate the capability of TSC and EOF equipment and data displays to clearly identify and reflect the affected unit. 3. Demonstrate the adequacy of communications for emergency support resources. Standard Criteria:

Planning Standard	EP Program Elements	Inspections, Tests, Analyses	Acceptance Criteria
			a. Emergency response facility personnel are able to operate primary or backup communication systems in accordance with Emergency Plan Implementing Procedures as needed during the exercise. b. Primary or backup emergency response communication systems listed in the Emergency Plan Implementing Procedures are available and operational for the duration of the exercise. E. *Radiological Assessment and Control* 1. Demonstrate the ability to obtain onsite radiological surveys and samples Standard Criteria: a. Health Physics personnel demonstrate the ability to obtain appropriate instruments and perform surveys as needed during the exercise. b. Airborne samples are taken, as appropriate, in accordance with Emergency Plan Implementing Procedures during the exercise. 2. Demonstrate the ability to continuously monitor and control radiation exposure to emergency workers. Standard Criteria: a. Emergency workers are issued self-reading dosimeters when radiation levels require, and exposures are controlled to 10 CFR Part 20 limits (unless the Emergency Coordinator authorizes emergency limits), as appropriate during the exercise. b. Exposure records are available during the exercise. 3. Demonstrate the ability to assemble and deploy field monitoring teams. Standard Criteria:

Planning Standard	EP Program Elements	Inspections, Tests, Analyses	Acceptance Criteria
			a. Field Monitoring Teams are briefed, obtain equipment, and are dispatched in accordance with Emergency Plan Implementing Procedures. 4. Demonstrate the ability to collect and disseminate field team data. Standard Criteria: a. Field teams collect data for dose rate and airborne radioactivity levels, as applicable, in accordance with emergency plan implementing procedures. b. Field team communicates data to the EOF in accordance with Emergency Plan Implementing Procedures during the exercise. 5. Demonstrate the ability to develop dose projections. Standard Criteria a. Timely and accurate dose projections are performed in accordance with Emergency Plan Implementing Procedures during the exercise. 6. Demonstrate the ability to develop appropriate Protective Action Recommendations (PARs) and notify appropriate authorities within 15 minutes, once data is available, after the declaration of a General Emergency or change in PARs during the exercise. Standard Criteria: a. Total Effective Dose Equivalent (TEDE) and Committed Dose Equivalent (CDE) dose projections from the dose assessment computer code are developed in accordance with Emergency Plan Implementing Procedures during the exercise. b. PARs are developed and transmitted within 15 minutes of data availability during the exercise.

Planning Standard	EP Program Elements	Inspections, Tests, Analyses	Acceptance Criteria
			8.1.2 Onsite emergency response personnel were mobilized in sufficient numbers to fill emergency response positions, and they successfully performed their assigned responsibilities. 8.1.3 The exercise was completed within the specified time periods of Appendix E to 10 CFR Part 50, offsite exercise objectives were met, and there were no uncorrected offsite exercise deficiencies, or a license condition requires offsite deficiencies to be corrected prior to operation above 5 percent of rated power.
9.0 Implementing Procedures			
10 CFR Part 50, App. E.V – No less than 180 days prior to the scheduled issuance of an operating license for a nuclear power reactor or a license to possess nuclear material, the applicant's detailed implementing procedures for its emergency plan shall be submitted to the Commission.	9.1 The licensee has submitted detailed implementing procedures for its emergency plan no less than 180 days prior to fuel load.	9.1 An inspection of the submittal letter will be performed.	9.1 The licensee submitted detailed implementing procedures for the onsite emergency plan no less than 180 days prior to fuel load.

List of Acronyms for Table 3.8-1:

ANS–Alert and Notification System
EAL–Emergency Action Level
EAS–Emergency Alerting System
ENS–Emergency Notification System
EOC–Emergency Operations Center
EOF–Emergency Operations Facility
EPA–Environmental Protection Agency
EP–Emergency Plan
EPZ–Emergency Planning Zone
ERDS–Emergency Response Data System
ERO–Emergency Response Organization
ESSX–Electric Switch System Exchange
FEMA–Federal Emergency Management Agency
HEPA–High Efficiency Particulate Air
HPN–Health Physics Network
JIC–Joint Information Center
KI–Potassium Iodide
OSC–Operations Support Center
PAG–Protective Action Guide
SCEMD–South Carolina Emergency Management Division
TSC–Technical Support Center
VCSNS–V. C. Summer Nuclear Station

Table 13.6A-1 – Site-Specific Physical Security Inspections, Tests, Analyses and Acceptance Criteria

Design Commitment	Inspections, Tests, and Analyses	Acceptance Criteria
1. The external walls, doors, ceiling, and floors in the location within which the last access control function for access to the protected area is performed are bullet-resistant to at least Underwriters Laboratory Ballistic Standard 752, level 4.	Type test, analysis, or a combination of type test and analysis will be performed for the external walls, doors, ceilings, and floors in the location within which the last access control function for access to the protected area is performed.	The external walls, doors, ceilings, and floors in the location within which the last access control function for access to the protected area is performed are bullet- resistant to at least Underwriters Laboratory Ballistic Standard 752, level 4.
2. Physical barriers for the protected area perimeter are not part of vital area barriers.	An inspection of the protected area perimeter barrier will be performed.	Physical barriers at the perimeter of the protected area are separated from any other barrier designated as a vital area barrier.
3. a) Isolation zones exist in outdoor areas adjacent to the physical barrier at the perimeter of the protected area that allows 20 feet of observation on either side of the barrier. Where permanent buildings do not allow a 20-foot observation distance on the inside of the protected area, the building walls are immediately adjacent to, or an integral part of, the protected area barrier.	Inspections will be performed of the isolation zones in outdoor areas adjacent to the physical barrier at the perimeter of the protected area.	Isolation zones exist in outdoor areas adjacent to the physical barrier at the perimeter of the protected area and allow 20 feet of observation and assessment of the activities of people on either side of the barrier. Where permanent buildings do not allow a 20-foot observation and assessment distance on the inside of the protected area, the building walls are immediately adjacent to, or an integral part of, the protected area barrier and the 20-foot observation and assessment distance does not apply.
b) The isolation zones are monitored with intrusion detection equipment that provides the capability to detect and assess unauthorized persons.	Inspections will be performed of the intrusion detection equipment within the isolation zones.	The isolation zones are equipped with intrusion detection equipment that provides the capability to detect and assess unauthorized persons.

Table 13.6A-1 – Site-Specific Physical Security Inspections, Tests, Analyses and Acceptance Criteria

Design Commitment	Inspections, Tests, and Analyses	Acceptance Criteria
4. The intrusion detection and assessment equipment at the protected area perimeter: a) detects penetration or attempted penetration of the protected area barrier and concurrently alarms in both the central alarm station and secondary alarm station, and b) remains operable from an uninterruptible power supply in the event of the loss of normal power.	Tests, inspections or a combination of tests and inspections of the intrusion detection and assessment equipment at the protected area perimeter and its uninterruptible power supply will be performed.	The intrusion detection and assessment equipment at the protected area perimeter: a) detects penetration or attempted penetration of the protected area barrier and concurrently alarms in the central alarm station and secondary alarm station, and b) remains operable from an uninterruptible power supply in the event of the loss of normal power.
5. Access control points are established to: a) control personnel and vehicle access into the protected area. b) detect firearms, explosives, and incendiary devices at the protected area personnel access points.	Tests, inspections, or combination of tests and inspections of installed systems and equipment at the access control points to the protected area will be performed.	The access control points for the protected area: a) are configured to control personnel and vehicle access. b) include detection equipment that is capable of detecting firearms, incendiary devices, and explosives at the protected area personnel access points.
6. An access control system with numbered picture badges is installed for use by individuals who are authorized access to protected areas and vital areas without escort.	A test of the access control system with numbered picture badges will be performed.	The access authorization system with numbered picture badges can identify and authorize protected area and vital area access only to those personnel with unescorted access authorization.
7. Access to vital equipment physical barriers requires passage through the protected area perimeter barrier.	Inspection will be performed to confirm that access to vital equipment physical barriers requires passage through the protected area perimeter barrier.	Vital equipment is located within a protected area such that access to vital equipment physical barriers requires passage through the protected area perimeter barrier.

Table 13.6A-1 – Site-Specific Physical Security Inspections, Tests, Analyses and Acceptance Criteria

Design Commitment	Inspections, Tests, and Analyses	Acceptance Criteria
8. a) Penetrations through the protected area barrier are secured and monitored.	Inspections will be performed of penetrations through the protected area barrier.	Penetrations and openings through the protected area barrier are secured and monitored.
b) Unattended openings (such as underground pathways) that intersect the protected area boundary or vital area boundary will be protected by a physical barrier and monitored by intrusion detection equipment or provided surveillance at a frequency sufficient to detect exploitation.	Inspections will be performed of unattended openings that intersect the protected area boundary or vital area boundary.	Unattended openings (such as underground pathways) that intersect the protected area boundary or vital area boundary are protected by a physical barrier and monitored by intrusion detection equipment or provided surveillance at a frequency sufficient to detect exploitation.
9. Emergency exits through the protected area perimeter are alarmed and secured with locking devices to allow for emergency egress.	Tests, inspections, or a combination of tests and inspections of emergency exits through the protected area perimeter will be performed.	Emergency exits through the protected area perimeter are alarmed and secured by locking devices that allow prompt egress during an emergency.

14.0 INITIAL TEST PROGRAMS

The initial test program covers structures, systems, and components (SSCs) and design features for both the nuclear portion of the facility and the balance of plant. The information provided addresses the major phases of the test program, including preoperational tests, initial fuel loading and initial criticality, low-power tests, and power ascension tests. The scope of the initial test program as well as its general plans for accomplishing the test program is described in sufficient detail to demonstrate that due consideration has been given to matters that normally require advance planning.

The technical aspects of the initial test program are described in sufficient detail to show that: (1) the test program adequately verifies the functional requirements of plant SSCs; and (2) the sequence of testing is such that the safety of the plant does not depend on untested SSCs. In addition, measures are described to ensure that: (1) the initial test program is accomplished with adequate numbers of qualified personnel; (2) adequate administrative controls will be established to govern the initial test program; (3) the test program is used, to the extent practicable, to train and familiarize the plant's operating and technical staff in the operation of the facility; and (4) the adequacy of plant operating and emergency procedures is verified, to the extent practicable, during the period of the initial test program.

This chapter also provides information on the inspections, tests, analyses and acceptance criteria (ITAAC) that are proposed to demonstrate that, when the ITAAC are performed and the acceptance criteria met, the facility has been constructed and will operate in conformance with the combined license (COL), the Atomic Energy Act, and Nuclear Regulatory Commission (NRC) regulations.

14.1 Specific Information to be Included in Preliminary/Final Safety Analysis Reports (Related to RG 1.206, Section C.III.1, Chapter 14, C.I.14.1, "Specific Information To Be Addressed for the Initial Plant Test Program")

Section 14.1 of the V.C. Summer Nuclear Station (VCSNS) COL Final Safety Analysis Report (FSAR), Revision 5, incorporates by reference, with no departures or supplements, Section 14.1, "Specific Information to be Included in Preliminary/Final Safety Analysis Reports," of Revision 19 of the AP1000 Design Control Document (DCD). The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[19] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," and its supplements.

[19] See Section 1.2.2 for a discussion of the staff's review related to verification of the scope of information to be included in a COL application that references a design certification (DC).

14.2 Specific Information to be Included in Standard Safety Analysis Reports (Related to RG 1.206, Section C.III.1, Chapter 14, C.I.14.2, "Initial Plant Test Program")

14.2.1 Summary of Test Program and Objectives

14.2.1.1 *Introduction*

This section describes the major phases of the initial test program as well as the general prerequisites and specific objectives to be achieved for each phase.

14.2.1.2 *Summary of Application*

Section 14.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 14.2 of the AP1000 DCD, Revision 19. Section 14.2 of the DCD includes Section 14.2.1.

In addition, in VCSNS COL FSAR Section 14.2.1, the applicant provided the following:

AP1000 COL Information Item

- STD COL 14.4-3

The applicant provided additional information in standard (STD) COL 14.4-3 to address the COL holder's responsibility for development of a site-specific startup administrative manual (procedure) that will include the administrative procedures and requirements that will govern the activities associated with the plant's initial test program. Also added was information related to first of a kind testing features.

Additionally, the applicant described how the initial test program is applied to the facility. This information was provided to supplement the information incorporated by reference from the AP1000 DCD.

14.2.1.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the test program summary and objectives are given in Section 14.2 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants LWR Edition)."

The applicable regulatory requirements for the information being reviewed in this section are Title 10 of the *Code of Federal Regulations* (10 CFR) 52.79(a)(28) and Criterion XI of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants" to 10 CFR Part 50, "Domestic licensing of production and utilization facilities." Regulatory Guide (RG) 1.68, Revision 3, "Initial Test Program for Water-Cooled Nuclear Power Plants," provides guidance on how to comply with Criterion XI of Appendix B to 10 CFR Part 50.

14.2.1.4 *Technical Evaluation*

The NRC staff reviewed Section 14.2.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the initial test program summary and objectives. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this safety evaluation report (SER) provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (Vogtle Electric Generating Plant (VEGP), Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs).

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 14.2.1.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 14.4-3*

The NRC staff reviewed STD COL 14.4-3 related to COL Information Item 14.4-3 included in the VEGP COL FSAR. The applicant provided additional information to address COL Information Item 14.4-3 and to supplement the information addressed in the AP1000 DCD.

COL Information Item 14.4-3 states:

> *The Combined License holder is responsible for a site-specific startup administration manual (procedure), which contains the*

administration procedures and requirements that govern the activities associated with the plant initial test program, as identified in Subsection 14.2.3.

This commitment was also captured as COL Action Item 14.4-3 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

The COL applicant is responsible for preparing a startup administrative manual which contains the administrative procedures and standards that govern the activities associated with the plant initial test program.

STD COL 14.4-3 was not explicitly evaluated in Section 14.2.1.4 of the BLN SER. However, portions of the evaluation material in Section 14.2.1.4 of the BLN SER are directly applicable to this COL item. Therefore, the NRC staff used this evaluation material, identified below as standard content material, in the disposition of STD COL 14.4-3, as it relates to the initial test program summary and objectives.

The staff reviewed Section 14.2.1 and requested that as part of RAI 14.2-12, dated December 8, 2008, the applicant describe how the BLN test program meets the objectives in Section 14.2.1 of the AP1000 DCD, Revision 17. In its January 22, 2009, response to this RAI, the applicant proposed to revise Section 14.2.1 of the BLN COL FSAR to supplement Section 14.2.1 of the AP1000 DCD, Revision 17. The applicant stated in its response that Section 14.2 of the BLN COL FSAR describes the controls that will be implemented in the site-specific startup administrative manual (procedure). The applicant also described the testing of first-of-a-kind design features and the use of operating experience (OE) from previous first-of-a-kind tests performed on other AP1000 plants. Additionally, the applicant proposed to develop administrative controls for crediting previously performed testing of first-of-a-kind AP1000 design features.

The staff determined that the proposed changes adequately clarify the objectives of the initial test program, consistent with the guidance in RG 1.68. Therefore, the staff finds this change acceptable. The applicant will revise the BLN COL FSAR to include the proposed administrative controls. This item is identified as ***Confirmatory Item 14.2-1****, pending NRC review and approval of the revised BLN COL FSAR.*

Resolution of Standard Content Confirmatory Item 14.2-1

The staff verified that the VEGP applicant has incorporated into its FSAR the proposed administrative controls identified as Confirmatory Item 14.2-1 in the staff's SER for the BLN COL. On this basis, Confirmatory Item 14.2-1 is resolved.

14.2.1.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

14.2.1.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the application addressed the required information relating to the initial test program summary and objectives and there is no outstanding information to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VCSNS COL FSAR is acceptable because it meets the requirements of 10 CFR 52.79(a)(28) and Criterion XI of Appendix B to 10 CFR Part 50. The staff based its conclusions on the following:

- STD COL 14.4-3 is acceptable because it provides an adequate description of the administrative requirements associated with the test program objectives that will be implemented during the conduct of the initial test program.

14.2.2 Organization, Staffing, and Responsibilities (Related to RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.2, "Organization and Staffing")

14.2.2.1 *Introduction*

The organization used to manage, supervise, or execute all phases of the initial test program is described. This description includes the organizational responsibilities and authorities, the degree of participation of each organizational unit in the implementation of the initial test program, and personnel training, experience, and qualification requirements.

14.2.2.2 *Summary of Application*

Section 14.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 14.2 of the AP1000 DCD, Revision 19. Section 14.2 of the DCD includes Section 14.2.2.

VCSNS COL FSAR Section 14.2.2 addresses the plant test and operations organization (PT&O) and other organizations that will participate in the implementation of the initial test program.

In addition, in VCSNS COL FSAR Section 14.2.2, the applicant provided the following:

AP1000 COL Information Item

- STD COL 14.4-1

The applicant provided additional information in STD COL 14.4-1 to provide a description of the organization, staffing, and responsibilities related to the initial test program.

14.2.2.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the organization, staffing, and responsibilities are given in Section 14.2 of NUREG-0800.

The applicable regulatory requirements for the information being reviewed in this section are 10 CFR 52.79(a)(28) and Criterion XI of Appendix B to 10 CFR Part 50. RG 1.68 provides guidance on how to comply with Criterion XI of Appendix B to 10 CFR Part 50.

14.2.2.4 *Technical Evaluation*

The NRC staff reviewed Section 14.2.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the initial test program organization, staffing, and responsibilities. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 14.2.2.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 14.4-1*

The NRC staff reviewed STD COL 14.4-1 related to COL Information Item 14.4-1 included under Section 14.2.2 of the BLN COL FSAR. The applicant provided

information to replace the existing information in AP1000 DCD Section 14.2.2 with a description of the organization, staffing, and responsibilities related to the initial test program. This information was provided to address COL Information Item 14.4-1 in the AP1000 DCD, Revision 17. COL Information Item 14.4-1 states:

> *The specific staff, staff responsibilities, authorities, and personnel qualifications for performing the AP1000 initial test program are the responsibility of the Combined License applicant. This test organization is responsible for the planning, executing, and documenting of the plant initial testing and related activities that occur between the completion of plant/system/component construction and commencement of plant commercial operation. Transfer and retention of experience and knowledge gained during initial testing for the subsequent commercial operation of the plant is an objective of the test program.*

This commitment was also captured as COL Action Item 14.4-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will establish the specific staff, staff responsibilities, authorities, and personnel qualifications for performing the AP1000 initial test program.*

To address STD COL 14.4-1, the applicant described the PT&O organization in Section 14.2.2 of the BLN COL FSAR. The applicant stated that the PT&O organization will be responsible for the implementation of the initial test program, including the construction and installation, preoperational, and startup testing phases. In addition, the applicant described the responsibilities, interfaces, and authorities of the positions in the PT&O organization, including the following:

- *Manager in charge of the PT&O organization, responsible for staffing the PT&O organization, developing procedures for the preoperational and startup test phases, managing the initial test program, implementing the initial test program schedule, and manage contracts associated with the initial test program.*

- *Functional Manager in charge of the PT&O support, responsible for the implementation of plans, schedules, and development and approval of test procedures.*

- *PT&O Engineers, responsible for the development of system test procedures.*

- *Functional manager in charge of startup, responsible for the management of preoperational and startup testing. Activities include participation in the Joint Test Working Group (JTWG), preparation of the detailed schedule for preoperational and startup test activities, coordination of vendor participation in the initial test program, supervising and directing startup engineers, and developing periodic progress reports.*

- *Startup Engineers, responsible for coordinating testing activities, identifying special or temporary equipment or services needed to support testing, ensuring compliance with administrative controls, and reviewing and evaluating test results.*

- *PT&O organization personnel qualifications and training program description.*

The staff reviewed the applicant's proposed resolution to COL Information Item 14.4-1 addressing organizational and staffing responsibilities for the initial test program. In its review, the staff identified areas where additional information was needed.

In RAIs 14.2-5 and 14.2-6, dated May 15, 2008, the staff requested that the applicant supplement the information incorporated by reference from Section 14.2.2 of the AP1000 DCD, Revision 17, and provide a description of the responsibilities, authorities, interfaces, and qualifications requirements of the organizations responsible for the overall administration of the initial test program, consistent with the guidance in RG 1.206 and Section 14.2 of NUREG-0800. In its response to RAIs 14.2-5 and 14.2-6, dated June 26, 2008, the applicant stated that Section 14.4 of the BLN COL FSAR incorporated by reference Section 14.4.3 of the AP1000 DCD and no further changes to the BLN COL FSAR were needed. However, the staff determined that the information included in BLN COL FSAR was insufficient. Therefore, the staff asked the applicant in RAI 14.2-12, dated December 8, 2008, to provide information regarding the organization(s) that will be in charge of the overall administration, technical direction, coordination, and implementation of the initial test program. Specifically, the staff requested that the applicant provide organizational descriptions of the principal management positions (including any augmenting organizations) responsible for planning, executing, and documenting preoperational and startup testing activities. RAI 14.2-12 stated that this description should include the authorities, responsibilities and interfaces, and the degree of participation of each identified organizational unit. Additionally, the staff requested that the applicant describe training and qualification requirements for organizations responsible for implementing the initial test program.

In its response to RAI 14.2-12 dated January 22, 2009, the applicant proposed to include in Section 14.2.2 of the BLN COL FSAR, a description of the following organizational groups that will participate in the implementation of the initial test program:

- *The JTWG, including details of the key responsibilities, authorities, and interfaces*

- *The Site Construction Group (Architect-Engineer), including participating organizations, authorities, interfaces, and functional responsibilities*

- *The Site Preoperational Test Group, including participating organizations, authorities, interfaces, and functional responsibilities*

- *The Site Startup Test Group, including participating organizations, authorities, interfaces, and functional responsibilities*

In addition, the applicant proposed to include information related to the education, training, experience, and qualification requirements of supervisory personnel, test personnel, and other major participating organizations responsible for implementing the initial test program and developing testing, operating, and emergency procedures. This description would include administrative provisions for the establishment of a training program consistent with the criteria described in Three Mile Island (TMI) Action Plan Item I.G.1, (NUREG-0737, "Clarification of TMI Action Plan Requirements") and considerations for staffing effects that could result from overlapping initial test programs at multi-unit sites.

The staff reviewed the proposed organizational description provided by the applicant as part of the response to RAI 14.2-12. The applicant proposed to describe its overall responsibility for the conduct of the initial test program and also proposed to include a description of the major organizations that will be responsible for the administration and technical direction of the initial test program. To this end, the applicant proposed to include in Section 14.2.2.3 of the BLN COL FSAR the functions, responsibilities, and composition of the JTWG. Specifically, the JTWG will be composed of representatives from the plant's operations group, Westinghouse, the Architect-Engineer, and representatives from the test support groups. The applicant proposed to include a description of the responsibilities, authorities, and interfaces of these organizations. The JTWG will provide oversight of the implementation of the initial test program, including planning, scheduling, and performance of preoperational and startup testing. Also, the JTWG will review, evaluate, and approve administrative and test procedures, and will review and evaluate construction, preoperational, and startup test results and test turnover packages. The applicant proposed to revise the BLN COL FSAR to include the proposed organizational description.

Additionally, the applicant proposed to include a description of the responsibilities, authorities, and interfaces of supporting organizations including the Site Construction Group (Architect-Engineer), the Site Preoperational Test Group, and the Site Startup Test Group. A description of each proposed test group follows.

Section 14.2.2.4 of the BLN COL FSAR would be revised to describe the Site Construction Group (Architect-Engineer). The Site Construction Group will be composed, as necessary, of members from the construction group, the construction services group, the construction services procurement group, and the construction services quality group. The Site Construction Group will provide oversight of construction installation and testing, vendor interface and procurement associated with support testing activities, and turnover of tested equipment, systems, and testing documentation to the Site Preoperational Test Group.

Section 14.2.2.5 of the BLN COL FSAR would be revised to describe the Site Preoperational Test Group. The Site Preoperational Test Group will consist of

engineering leads and preoperational test teams, and will accept turnover of systems and equipment from the construction organization, and plan, scope, schedule, and oversee testing of plant systems. Additionally, the Site Preoperational Test Group will coordinate tagging and maintenance of systems, will provide coordination with other participating organizations, and will resolve open items and exceptions identified during the implementation of the preoperational test program.

Section 14.2.2.6 of the BLN COL FSAR would be revised to describe the Site Startup Test Group. The Site Startup Test Group will include engineering leads and startup test teams, and will be responsible for the acceptance of SSCs for integrated testing. In addition, the Site Startup Test Group will manage and oversee the testing of plant SSCs to support the plant power ascension test program, and will accept and turn over startup test packages to the site licensee.

The applicant also proposed to include information in Section 14.2.2.2 of the BLN COL FSAR to address training and qualification requirements for individuals and organizations implementing the initial test program. The response stated that the training organization will develop procedures to implement a training and qualification program in accordance with the requirements of the licensee quality assurance program and in coordination with Westinghouse. This training and qualification program will be used to confirm that test personnel have adequate training, qualification, and certification. In addition, the proposed training and qualification program will confirm that experienced and qualified personnel are available to develop testing, operating, and emergency procedures. The proposed training and qualification program will also provide supplemental operator training in accordance with TMI Action Plan Item I.G.1. The response stated that the site-specific startup administrative manual will contain measures to verify that personnel formulating and conducting test activities are not the same personnel who designed or are responsible for satisfactory performance of systems or design features under test. In addition, the startup administrative manual will provide controls for the consideration of staffing effects that could result from overlapping initial test programs at multi-unit sites.

The staff determined that the proposed changes adequately define the organizations that will carry out the initial test program, describe the authorities, responsibilities, and interfaces, and delineate training and qualification requirements for organizations participating in the implementation of the initial test program, consistent with the guidance in RG 1.68. Additionally, Section 1.0, Table 1.9-201 of the BLN COL FSAR includes a commitment to RG 1.8, Revision 3, "Qualification and Training of Personnel for Nuclear Power Plants," which provides training and qualification requirements for nuclear power plant personnel, including personnel participating in initial test program activities. The applicant will revise the BLN COL FSAR to include the proposed administrative controls. Therefore, the staff finds this change acceptable. This is identified as ***Confirmatory Item 14.2-2****, pending NRC review and approval of the revised BLN COL FSAR.*

Resolution of Standard Content Confirmatory Item 14.2-2

The staff verified that the VEGP applicant has incorporated into its FSAR the proposed administrative controls identified as Confirmatory Item 14.2-2 in the staff's SER for the BLN COL. On this basis, Confirmatory Item 14.2-2 is resolved.

Evaluation of Additional Information

In its letter dated November 11, 2010, the VEGP applicant provided additional information on the training and qualification requirements for nonsupervisory test engineers participating in initial test program activities. In the standard content evaluation presented above for STD COL 14.4-1, the staff notes that RG 1.8 is referenced by the applicant as providing the training and qualification requirements for nuclear power plant personnel, including personnel participating in initial test program activities. In the November 11, 2010, letter, the applicant stated that VEGP COL FSAR Section 14.2.2.2 would be revised to state that acceptable qualifications for nonsupervisory test engineers will follow the guidance provided in RG 1.28 as discussed in VEGP COL FSAR Appendix 1AA, i.e., Appendix 2A-1 of American Society of Mechanical Engineers (ASME) NQA-1-1994, "Quality Assurance Requirements for Nuclear Facility Applications."

The use of ASME NQA-1-1994 is endorsed in Section 17.5 of NUREG-0800 as providing an acceptable means for complying with 10 CFR Part 50, Appendix B, Criterion II, "Quality Assurance Program." Specifically, Item T of Part II of Section 17.5 of NUREG-0800 references ASME NQA-1-1994 in its guidance on training and qualification for personnel associated with inspection and testing activities. Therefore, the staff finds acceptable the proposed changes to VEGP COL FSAR Section 14.2.2.2, as stated in the applicant's November 11, 2010, letter. The planned VEGP COL application changes will be tracked as ***VEGP Confirmatory Item 14.2-1****.*

Resolution of VEGP Standard Content Confirmatory Item 14.2-1

VEGP Confirmatory Item 14.2-1 is an applicant commitment to revise its FSAR to specify the qualifications for test engineers. The staff verified that VEGP COL FSAR Section 14.2.2.2 was appropriately updated. As a result, VEGP Confirmatory Item 14.2-1 is now closed. The applicant indicated that the proposed changes to its FSAR Section 14.2.2.2 is expected to be standard for the subsequent COL applicants. Since Confirmatory Item 14.2-1 already exists as a standard confirmatory item in this SER, the staff designated this standard confirmatory item as VEGP Confirmatory Item 14.2-1.

14.2.2.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

14.2.2.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the application addressed the required information relating to the initial test program organization, staffing, and responsibilities and there is no outstanding information to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that, the information presented in the VCSNS COL FSAR is acceptable because it meets the requirements of 10 CFR 52.79(a)(28) and Criterion XI of Appendix B to 10 CFR Part 50. The staff based its conclusions on the following:

- STD COL 14.4-1 is acceptable because it provides an adequate description of the organizational responsibilities and authorities, the degree of participation of each organizational unit in the implementation of the initial test program, and personnel training, experience, and qualification requirements and meets the guidance in RG 1.68.

14.2.3 Test Specifications and Test Procedures (Related to RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.3, "Test Procedures," C.I.14.2.4, "Conduct of Test Program," C.I.14.2.5, "Review, Evaluation, and Approval of Test Results," and C.I.14.2.6, "Test Records")

14.2.3.1 *Introduction*

Test specifications and test procedures address the process used to develop, review, and approve individual test procedures, including the organizational units or personnel that are involved in performing these activities and their respective responsibilities.

"Conduct of Test Program" describes the administrative controls that govern the conduct of each major phase of the test program. This description includes the administrative controls used to ensure that the necessary prerequisites are satisfied for each major phase and for individual tests. Controls to be followed during plant modifications or maintenance tasks that are determined to be necessary to conduct the test program are also described, as well as the methods used to ensure retesting following such modifications or maintenance.

"Review of Test Results" describes the specific controls to be established for the review, evaluation, and approval of test results by appropriate personnel and/or organizations. This description includes specific controls to be established to ensure notification of affected and responsible organizations or personnel when test acceptance criteria are not met, as well as the controls established to resolve such matters.

In addition, administrative controls to identify and cross-reference each test (or portion thereof) required to be completed before initial fuel loading to satisfy ITAAC in accordance with 10 CFR 52.99(a) are discussed.

14.2.3.2 *Summary of Application*

Section 14.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 14.2 of the AP1000 DCD, Revision 19. Section 14.2 of the DCD includes Section 14.2.3.

In addition, in VCSNS COL FSAR Sections 14.2 and 14.4, the applicant provided the following:

AP1000 COL Information Items

- STD COL 14.4-2

The applicant provided additional information in STD COL 14.4-2 to address COL holder responsibility for the development of test specifications and test procedures.

- STD COL 14.4-3

The applicant provided additional information in STD COL 14.4-3 to address COL holder responsibility for the development of a site-specific startup administrative manual (procedure) that will include the administrative procedures and requirements that will govern the activities associated with the plant's initial test program.

- STD COL 14.4-4

The applicant provided additional information in STD COL 14.4-4 to address COL holder responsibility for the review and evaluation of test results.

Supplemental Information

- STD SUP 14.2-5

The applicant provided additional information in STD Supplement (SUP) 14.2-5 to address administrative requirements for the preparation of work requests.

- STD SUP 14.2-6

The applicant provided additional information in STD SUP 14.2-6 to address administrative requirements for turnover of systems and components during the construction phase.

- STD SUP 14.2-7

The applicant provided additional information in STD SUP 14.2-7 to address administrative controls for the conduct of modifications during the initial test program.

- STD SUP 14.2-8

The applicant provided additional information in STD SUP 14.2-8 to address administrative controls for the conduct of maintenance during the initial test program.

In addition, in Part 10 of the VCSNS COL application, the applicant provided the following information:

License Conditions

- Part 10, License Condition 2, Items 14.4-2, 14.4-3 and 14.4-4

The proposed license conditions will require the licensee to complete the actions described in STD COL 14.4-2 and STD COL 14.4-4 prior to fuel loading and STD COL 14.4-3 prior to initiation of the test program. In a letter dated November 16, 2010, the applicant endorsed the VEGP letter dated October 15, 2010, that proposed revisions to Items 14.4-3 and 14.4-4.

- Part 10, License Condition 6

The proposed license condition will require the licensee to provide a schedule to support NRC inspections of operational programs including a submittal for approved preoperational and startup test procedures. In a letter dated November 16, 2010, the applicant endorsed the VEGP letter dated October 15, 2010, that proposed revisions to Items 14.4-3 and 14.4-4.

- Part 10, License Condition 8

The proposed license condition will require the licensee to report any changes to the initial test program within one month of such a change.

14.2.3.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the test specifications and test procedures, conduct of test program, and review and evaluation of test results are given in Section 14.2 of NUREG-0800.

The applicable regulatory requirements for the information being reviewed in this section are 10 CFR 52.79(a)(28) and Criterion XI of Appendix B to 10 CFR Part 50. RG 1.68 provides guidance on how to comply with Criterion XI of Appendix B to 10 CFR Part 50.

14.2.3.4 *Technical Evaluation*

The NRC staff reviewed Section 14.2.3 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the test specifications and procedures, conduct of test program, and review and evaluation of test results. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard

content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 14.2.3.4 of the VEGP SER:

AP1000 COL Information Items

- *STD COL 14.4-2, addressing test specifications and test procedures.*

The NRC staff reviewed STD COL 14.4-2 related to COL Information Item 14.4-2 included in the BLN COL FSAR. The applicant provided information to address COL Information Item 14.4-2 and to supplement the information addressed in the AP1000 DCD, Revision 17. COL Information Item 14.4-2 states:

> *The Combined License holder will provide the Preoperational and Startup Procedures to the NRC prior to each planned test in accordance with the requirements of DCD Subsection 14.2.3.*
>
> *The following words represent the original Combined License Information Item commitment:*
>
> > *The Combined License applicant is responsible for providing test specifications and test procedures for the preoperational and startup tests, as identified in Subsection 14.2.3, for review by the NRC.*

The commitment was also captured as COL Action Item 14.4-2 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will develop test specifications and procedures for the preoperational and startup tests for review by the NRC.*

The staff reviewed the applicant's proposed resolution of COL Information Item 14.4-2.

In reviewing Section 14.2 of the BLN COL FSAR, Revision 0, the applicant did not provide a description of the methodology used to develop test specifications and procedures; did not provide a description of the controls to ensure the participation of the design organization(s), the COL applicant, architect-engineer(s), and other major contractors, subcontractors, and vendors, as applicable; and did not discuss the qualification or experience requirements for personnel participating in the development of test specifications and test procedures. In RAI 14.2-8, the staff requested that the applicant provide information regarding the methodology that will be used for the generation, review, and approval of preoperational and startup test procedures. Additionally, the staff requested that the applicant explain which provisions in the application ensure the availability of approved test procedures for review by NRC inspectors at least 60 days before their intended use, and ensure timely notification to the NRC of changes in approved test procedures that have been made available for NRC review.

In its response to RAI 14.2-8 dated June 26, 2008, the applicant stated that Section 14.2.3 of the AP1000 DCD provided administrative controls to ensure that approved test procedures will be provided to the NRC about 60 days prior to the scheduled performance of preoperational tests, such as test for systems and components that perform safety-related functions, and tests of systems and components that are non-safety-related but perform defense-in-depth functions. The staff found this response acceptable. However, the applicant did not provide a description of the administrative controls to be used to develop, review, and approve preoperational and startup test procedures. In RAI 14.2-12, dated December 8, 2008, the staff requested that the applicant provide such a description in the BLN COL FSAR.

In its response to RAI 14.2-12 dated January 22, 2009, the applicant proposed to include in Section 14.2.3 of the BLN COL FSAR the following administrative controls that will be prescribed in the site-specific startup administrative manual for the development, review, and approval of test specifications and test procedures:

- *Provisions to ensure that the appropriate technical information required for the preparation of test procedures is included, including prerequisites, format and content, objectives, test conditions, and acceptance criteria*

- *Provisions to ensure the participation of the design organization in the development of detailed test procedures*

- *Provisions to ensure that personnel developing and reviewing test procedures have the appropriate technical background and experience*

- *Provisions to ensure the availability of test procedures to the NRC onsite inspectors approximately 60 days prior to their intended use*

The staff reviewed the applicant's response to this RAI and determined that the proposed changes provide the general methods and administrative provisions to control procedure development, review, and approval, including the responsibilities of the various organizations participating in this process, consistent with the guidance in RG 1.68. The applicant will revise the BLN COL FSAR to include the proposed administrative controls. Therefore, the staff finds the proposed change acceptable. This is identified as ***Confirmatory Item 14.2-3****, pending NRC review and approval of the revised BLN COL FSAR.*

The applicant identified COL Information Item 14.4-2 as an activity that cannot be fully resolved prior to issuance of the COL. In BLN COL FSAR, Part 10, "License Conditions and ITAAC," License Condition 2, "COL Holder Items," the applicant proposed Item 14.4-2 to address the development of test specifications and test procedures. Additionally, the applicant proposed License Condition 6, "Operational Program Readiness," addressing implementation schedules to support planning for and conduct of NRC staff inspections of operational programs. Because the initial test program is identified as an operational program, the applicant provided implementation milestones consistent with the guidance contained in RG 1.206. To address the availability of test specifications and test procedures, Item d. of License Condition 6 requires a submittal schedule for preoperational and startup test procedures.

Since development of test specifications and test procedures will require detailed plant-specific design information and close coordination with design organizations, the staff determined that it is acceptable to develop detailed preoperational and startup test specifications and test procedures during the post-COL phase (See Section 14.2.3.5). Therefore, the staff finds acceptable proposed License Condition 2, Item 14.4-2. Concerns remain regarding the adequacy of administrative controls in License Condition 6, Item d., for the development of test specifications and test procedures. This is identified as ***Open Item 14.2-1.***

In RAI 14.2-11, the NRC staff requested that the applicant provide additional information regarding the provisions that will identify and cross-reference all or part of each test that is required to be completed before initial fuel loading and that is designed to satisfy ITAAC. The staff requested that the applicant revise Section 14.2 of the BLN COL FSAR to address this issue. In its September 3, 2008, response to RAI 14.2-11, the applicant stated that test procedures (or sections thereof) will be cross-referenced to ITAACs. In addition, activities related to ITAAC closure will include references to test procedures in order to facilitate NRC review and acceptance. The applicant stated that Chapter 14 of the BLN COL FSAR would be revised to include development of a cross-reference list between ITAACs and test procedures and/or sections of procedures. The staff confirmed that this change was incorporated in Revision 1 of the BLN COL FSAR. Section 14.4.2 of the BLN COL FSAR states that a cross-reference list will be developed between ITAACs and test procedures and/or sections of test procedures. The staff finds this change acceptable. This resolves RAI 14.2-11.

Resolution of Standard Content Confirmatory Item 14.2-3

The staff verified that the VEGP applicant has incorporated into its FSAR the proposed administrative controls identified as Confirmatory Item 14.2-3 in the staff's SER for the BLN COL. On this basis, Confirmatory Item 14.2-3 is resolved.

Resolution of Standard Content Open Item 14.2-1

Part 10 of the VEGP COL application, proposed License Condition 6, "Operational Program Readiness," describes the process for submitting to the appropriate Director of the NRC a schedule that will support planning for and conduct of NRC inspections of operational programs. The applicant also included, in Item c. of License Condition 6 (which corresponds to Item d. of License Condition 6 in the BLN COL application), administrative provisions for the submittal of approved preoperational and startup test procedures to NRC onsite inspectors in accordance with Section 14.2.3 of the FSAR. Following the evaluation of Item d. of License Condition 6 in the BLN COL application, as documented in the BLN SER, the staff has determined on closer examination that proposed License Condition 2, Item 14.4-2, will result in adequate administrative controls for the development of detailed test specifications and test procedures. On this basis, the staff finds that Item c. in proposed License Condition 6 of Part 10 of the VEGP COL application is acceptable and Open Item 14.2-1 is therefore resolved.

The following portion of this technical evaluation section is reproduced from Section 14.2.3.4 of the BLN SER:

- *STD COL 14.4-3, addressing the conduct of test program*

The NRC staff reviewed STD COL 14.4-3 related to COL Information Item 14.4-3 included in the BLN COL FSAR. The applicant provided additional information to address COL Information Item 14.4-3 and to supplement the information addressed in the AP1000 DCD, Revision 17. COL Information Item 14.4-3 states:

> *The Combined License holder is responsible for a site-specific startup administration manual (procedure), which contains the administration procedures and requirements that govern the activities associated with the plant initial test program, as identified in Subsection 14.2.3.*
>
> *The following words represent the original COL information item commitment:*
>
> > *The Combined License applicant is responsible for a startup administration manual (procedure), which contains the administration procedures and requirements that govern the activities associated with the plant initial test program, as identified in Subsection 14.2.3.*

This commitment was also captured as COL Action Item 14.4-3 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant is responsible for preparing a startup administrative manual which contains the administrative procedures and standards that govern the activities associated with the plant initial test program.*

In Section 14.4 of the BLN COL FSAR, the applicant incorporated by reference Section 14.4.3 of the AP1000 DCD, Revision 17. This section provided a summary overview of the administrative process and program controls to be utilized in the conduct of the AP1000 Startup Test Program at a licensed AP1000 operational plant site. It also provided a general description of responsibilities and activities related to the testing of plant equipment in the period between system turnover until plant acceptance.

The staff reviewed the information provided to address COL Information Item 14.4-3 related to the conduct of the initial test program in the BLN COL FSAR. In its review, the staff identified areas where additional information was needed. A description of the specific issues follows.

In RAI 14.2-4, the staff requested that the applicant supplement the information incorporated by reference from Section 14.4.3 of the AP1000 DCD, Revision 17, and to provide a description of the administrative controls that will be implemented during the conduct of the initial test program, consistent with the guidance in RG 1.206 and Section 14.2 of NUREG-0800. In its response to RAI 14.2-4 dated June 26, 2008, the applicant stated that Section 14.4 of the BLN COL FSAR incorporated by reference Section 14.4.3 of the AP1000 DCD and no further changes to the BLN COL FSAR were needed. However, the staff determined that the information included in BLN COL FSAR was insufficient. Therefore, in RAI 14.2-12 dated December 8, 2008 [SIC], the staff requested the applicant include a set of administrative controls for the conduct of the initial test program in Section 14.2 of the BLN COL FSAR.

In its response to RAI 14.2-12 dated January 22, 2009 and March 26, 2009, the applicant proposed to include in Section 14.2.3.1 of the BLN COL FSAR a description of the administrative controls for the control of testing activities. The proposed controls will include measures for procedure verification, work control, system turnover, conduct of modifications, and conduct of maintenance activities during the initial test program.

Section 14.2.3.1.1 would be revised to provide administrative controls for the verification of approved test procedures. The response stated that this section will include measures to consider design and licensing changes made after the development of test procedures to ensure that these changes are incorporated in approved test procedures. In addition, the applicant stated that available information regarding operating experience (OE) will be factored in the development of individual test procedures. Test deficiencies, nonconformances, exceptions, and failures will be tracked using the applicant's corrective action program. The applicant also proposed controls to involve design organizations in

the resolution of design-related problems that result in, or contribute to, a failure to meet test acceptance criteria. In its description, the applicant assigned responsibilities for the review of test procedures, test execution, data collection and recording, and for the review and evaluation of test results prior to commencing each major phase of the initial test program.

The following supplemental items were not in Revision 1 of the BLN FSAR and are addressed for the first time in this SER for the VEGP COL application. However, portions of the standard evaluation material in the BLN SER under the evaluation of STD COL 14.4-3 are directly applicable to the new STD SUP items identified in the VEGP FSAR. Therefore, the NRC staff used this evaluation material, identified below as standard content material, in the disposition of these supplemental items.

Supplemental Information

- *STD SUP 14.2-5*

The applicant provided additional information in STD SUP 14.2-5 to address administrative requirements for the preparation of work requests.

The following portion of this technical evaluation section is reproduced from Section 14.2.3.4 of the BLN SER:

Section 14.2.3.1.2 would be revised to provide administrative measures for the control of work requests and controls for the control of tagging requests. Specifically, the response stated that the applicant will be responsible for the preparation of work requests and for supervising minor repairs and modifications, changes to equipment settings, and disconnecting and reconnecting of electrical terminations. Additionally, the Startup Group will provide for the coordination of construction-related work requests. The applicant also stated that the Startup Test Engineers may perform independent verification of work requests. These activities will be controlled by administrative procedures.

- *STD SUP 14.2-6*

The applicant provided additional information in STD SUP 14.2-6 to address administrative requirements for turnover of systems and components during the construction phase.

The following portion of this technical evaluation section is reproduced from Section 14.2.3.4 of the BLN SER:

Section 14.2.3.1.3 would be revised to provide controls for system turnover during the conduct of the test program. The response proposed guidelines that will be used to define the boundary and interfaces between related systems/subsystems and to generate boundary scope documents. The response also proposed a systematic turnover process that includes requirements for the following:

- *Documenting inspections performed by the construction organization (e.g., highlighted drawings showing areas inspected)*
- *Documenting results of construction testing*
- *Determining the construction related inspections and tests that need to be completed before preoperational testing begins. Any open items are evaluated for acceptability before commencing preoperational testing.*
- *Developing and implementing plans for correcting adverse conditions and open items, and means for tracking such conditions and items*
- *Verifying completeness of construction and documentation of incomplete items*

- *STD SUP 14.2-7*

The applicant provided additional information in STD SUP 14.2-7 to address administrative controls for the conduct of modifications during the initial test program.

The following portion of this technical evaluation section is reproduced from Section 14.2.3.4 of the BLN SER:

Section 14.2.3.1.4 would be revised to include controls for modifications during the conduct of the test program. The response also proposed measures for retesting activities following such modifications. In its description, the applicant stated that modifications will be documented in test procedures and will contain restoration steps to confirm satisfactory restoration to the required configuration. Additionally, modifications will be reviewed to determine the scope of post-modification testing activities. Finally, the response stated that retesting for modifications will be documented and verified to ensure the validity of preoperational testing and ITAAC.

- *STD SUP 14.2-8*

The applicant provided additional information in STD SUP 14.2-8 to address administrative controls for the conduct of maintenance during the initial test program.

The following portion of this technical evaluation section is reproduced from Section 14.2.3.4 of the BLN SER:

Section 14.2.3.1.5 would be revised to include controls for corrective or preventive maintenance during the conduct of the initial test program. The response proposed that the applicant will review maintenance activities to determine post-maintenance testing to be performed. Additionally, post-maintenance testing will be conducted and documented, and its results verified to maintain the validity of preoperational testing and ITAAC.

The following portion of this technical evaluation section is reproduced from Section 14.2.3.4 of the BLN SER, and is applicable to all four STD SUP items discussed above.

The staff reviewed the applicant's response to this RAI and determined that this change provides an adequate set of administrative measures to control the conduct of the initial test program, consistent with the guidance in RG 1.68, RG 1.206, and Section 14.2 of NUREG-0800. The applicant will revise the BLN COL FSAR to include the proposed administrative controls. Therefore, the staff finds this change acceptable. This is identified as ***Confirmatory Item 14.2-4****, pending NRC review and approval of the revised BLN COL FSAR.*

In addition to the administrative controls for the conduct of the initial test program, the applicant identified COL Information Item 14.4-3 as an activity that cannot be fully resolved prior to issuance of the COL. In BLN COL FSAR, Part 10, "License Conditions and ITAAC," License Condition 2, "COL Holder Items," the applicant proposed Item 14.4-3 to address the development of a site-specific startup administrative manual. This site-specific startup administrative manual will contain the administration procedures and requirements that govern the activities associated with the plant initial test program, as described in Section 14.2 of the BLN COL FSAR. The applicant stated that the startup administrative manual will be provided to the NRC prior to initiating the initial test program. Additionally, in Part 10 of the BLN COL FSAR, proposed License Condition 8, "Startup Testing," the applicant discussed the process for making changes to the initial test program described in Chapter 14 of the Bellefonte COL FSAR. The applicant stated that any changes to the initial startup test program made in accordance with the provisions of 10 CFR 50.59 or Section VIII of Appendix D to 10 CFR Part 52 shall be reported in accordance with 50.59(d) within one month of such change.

The staff determined that it is acceptable to develop a site-specific startup administrative manual, which will contain the administrative procedures and standards that govern the activities associated with the plant initial test program, during the post-COL phase (see Section 14.2.3.5). Therefore, the staff finds acceptable proposed License Condition 2, Item 14.4-3. Concerns remain regarding the adequacy of administrative controls for changing the test program as described in License Condition 8. This is identified as ***Open Item 14.2-2.***

Resolution of Standard Content Confirmatory Item 14.2-4

The staff verified that the VEGP applicant has incorporated into its FSAR, as STD SUP 14.2-5 through STD SUP 14.2-8, the proposed administrative controls identified as Confirmatory Item 14.2-4 in the staff's SER for the BLN COL. On this basis, Confirmatory Item 14.2-4 is resolved.

Resolution of Standard Content Open Item 14.2-2

Part 10 of the VEGP COL application, proposed License Condition 8, "Startup Testing," describes the process for initiating changes to the initial test program. The applicant proposed to notify the NRC of any change made to the startup test program described in Chapter 14 of the VEGP COL FSAR in accordance with provisions of 10 CFR 50.59(d) or Section VIII of Appendix D. "Design Certification Rule for the AP1000 Design," to 10 CFR Part 52, "Licenses, certifications and approvals for nuclear power plants," within one month of such change. Following the evaluation of License Condition 8 in the BLN COL application, as documented in the BLN SER, the staff has determined, based on closer examination, that proposed License Condition 8 provides adequate administrative controls for notifying the NRC of changes to the test program, consistent with regulatory requirements in 10 CFR 50.59(d) and Section VIII of Appendix D to 10 CFR Part 52. On this basis, the staff determined that the applicant adequately addressed Open Item 14.2-2, and it is, therefore, resolved.

The following portion of this technical evaluation section is reproduced from Section 14.2.3.4 of the BLN SER:

AP1000 COL Information Item

- *STD COL 14.4-4, addressing the review and evaluation of test results*

The NRC staff reviewed STD COL 14.4-4 related to COL Information Item 14.4-4 included under Section 14.2.3.2 of the BLN COL FSAR. The applicant provided additional information to address COL Information Item 14.4-4 as described in the AP1000 DCD, Revision 17. COL Information Item 14.4-4 states:

> *The combined license holder is responsible for review and evaluation of individual test results as well as final review of overall test results and for review of selected milestones or hold points within the test phases. Test exceptions or results which do not meet acceptance criteria are identified to the affected and responsible design organizations, and corrective actions and retests, as required, are performed.*

The commitment was also captured as COL Action Item 14.4-4 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant or holder is responsible for review and evaluation of individual test results.*

In Section 14.2.3.2 of the BLN COL FSAR, the applicant provided specific administrative controls for the review and evaluation of test results. The applicant stated that the startup engineer is responsible for reviewing and evaluating the test data, test results, and verifying that the acceptance criteria have been met. The applicant also stated that test results will be reviewed and approved by the JTWG. The applicant included provisions to identify and notify the responsible design organizations when test exceptions or results do not meet acceptance criteria. The applicant also discussed the utilization of the corrective action program for tracking test results that do not meet the acceptance criteria, and for providing corrective action and retests, as required. Additionally, the applicant provided controls for the review of preoperational and startup test results, and for the retention of test reports.

While reviewing Section 14.2.3.2, the staff was unable to find provisions to ensure that retesting required for modification or maintenance remains in compliance with ITAAC. In RAI 14.2-10, the staff requested that the applicant provide additional information regarding the provisions to ensure that retesting remains in compliance with ITAAC. The staff requested that the applicant revise Section 14.2.3.2 of the BLN COL FSAR to include such provisions. In its September 8, 2008, response to the staff's RAI, the applicant stated that normal maintenance, repairs, and design changes are controlled by the configuration control process in conjunction with the quality assurance and corrective action programs. These processes will provide for the review of changes that could have an impact on ITAAC. The staff confirmed that Section 14.2.3.2 of the BLN COL FSAR, Revision 1, was amended to include provisions to verify that the results of retesting do not invalidate ITAAC. The staff finds this change acceptable. This resolves RAI 14.2-10.

In RAI 14.2-12, dated December 8, 2008, the staff requested that the applicant supplement Section 14.2.3.2 of the BLN COL FSAR by adding additional administrative controls to be implemented for the review, evaluation, and approval of test results, consistent with the guidance in RG 1.206. In its January 22, 2009, response to the staff's RAI, the applicant proposed controls and assigned responsibilities for the review of each major phase of the initial test program. Specifically, the applicant proposed to develop controls to assure that results of the preoperational and startup test phases will be reviewed and evaluated by qualified personnel from the PT&O and the JTWG organizations and approved by the plant manager. Also, the review of test results will include participation from design and construction organizations. Following each major phase of the initial test program, and before proceeding to the next stage of testing, the applicant will review test results to ensure that all required tests have been completed and that testing for the next major phase will be conducted in a safe manner. Additionally, the applicant proposed to develop controls to prepare startup test results in accordance with RG 1.16, "Reporting of Operating Information – Appendix A Technical Specifications."

The staff reviewed the applicant's response to RAI 14.2-12 and determined that the proposed changes provide administrative provisions to control the review, evaluation, and approval of test results, consistent with the guidance in RG 1.68, RG 1.206, and Section 14.2 of NUREG-0800. Therefore, the staff finds this change acceptable. The applicant will revise the BLN COL FSAR to include the

proposed administrative controls. This is identified as ***Confirmatory Item 14.2-5****, pending NRC review and approval of the revised BLN COL FSAR.*

In addition to the administrative controls for the review, evaluation, and approval of test results, the applicant identified COL Information Item 14.4-4 as an activity that cannot be fully resolved prior to issuance of the COL. In BLN COL FSAR, Part 10, "License Conditions and ITAAC," proposed License Condition 2, "COL Holder Items," the applicant proposed Item 14.4-4 to address the review and evaluation of test results. The applicant stated that the COL holder will be responsible for the review and evaluation of test results, as well as the final review of overall test results and for the review of selected milestones or hold points within the test phases. In addition, the applicant stated that test exceptions or results which do not meet acceptance criteria will be identified to the affected and responsible design organizations, and corrective actions and retests, as required, will be performed.

Since test results will not be available until a facility is built, the staff determined that it is appropriate and acceptable for the COL holder to review and evaluate individual test results during the post-COL phase (see Section 14.2.3.5). The staff reviewed the proposed license condition and determined that the applicant provided sufficient administrative controls for the review and evaluation of test results, consistent with the guidance contained in RG 1.68, RG 1.206, and Section 14.2 of NUREG-0800.

Test Records

In its response to RAI 14.2-12, the applicant proposed to supplement the information incorporated by reference from Section 14.2.3.3 of the AP1000 DCD, Revision 17. The applicant stated that startup test reports will be generated and will describe and summarize the completion of tests during the initial test program. These proposed reports will address each test described in the BLN COL FSAR, describe measured values of operating conditions or characteristics from the initial test program as compared to design or specification values, and describe corrective actions and information required by license conditions. The applicant also described the frequency of such reports. Specifically, these proposed reports will be submitted 9 months following initial criticality, 90 days after completion of the test program, or 90 days after the start of commercial operations. The applicant also stated that in the event that one report does not cover these three events (i.e., initial criticality, completion of the test program, and start of commercial operations), supplemental reports will be submitted every three months until all three events are completed.

The staff reviewed the applicant's response to RAI 14.2-12 and determined that the proposed changes provide a set of administrative provisions to generate test reports, consistent with the guidance in RG 1.68, RG 1.206, and Section 14.2 of NUREG-0800. Therefore, the staff finds this change acceptable. The applicant will revise the BLN COL FSAR to include the proposed administrative controls. This is identified as ***Confirmatory Item 14.2-6****, pending NRC review and approval of the revised BLN COL FSAR.*

The staff determined that the supplemental information provided by the applicant described an acceptable method for activities related to test specifications and test procedures, conduct of the initial test program, and review, evaluation, and approval of test results, consistent with the guidance in RG 1.68 and RG 1.206. Therefore, the staff finds this change to be acceptable.

Resolution of Standard Content Confirmatory Items 14.2-5 and 14.2-6

The staff verified that the VEGP applicant has incorporated into its FSAR the proposed administrative controls identified as Confirmatory Items 14.2-5 and 14.2-6 in the staff's SER for the BLN COL. On this basis, Confirmatory Items 14.2-5 and 14.2-6 are resolved.

Evaluation of Revised License Condition 2, Items 14.4-3 and 14.4-4

In a letter dated October 15, 2010, the applicant proposed revisions to Items 14.4-3 and 14.4-4 of License Condition 2. Item 14.4-3 (evaluated above as part of the four SUP items) and Item 14.4-4 (evaluated above as part of STD COL 14.4-4) are considered unnecessary by the applicant as they can be adequately addressed by other proposed license conditions. The applicant proposed to replace the current text for Item 14.4-3 with, "Note - addressed by proposed License Conditions #3 and #6," and proposed to replace the current text for Item 14.4-4 with, "Note - addressed by proposed License Condition #9."

The text of Item 14.4-3 of License Condition 2 proposed to be deleted by the applicant's October 15, 2010, letter states that a site-specific startup administration manual (procedure), which includes the administration procedures and requirements that govern the activities associated with the plant's initial test program, would be provided prior to initiating the plant initial test program. Proposed License Condition 3 requires the operational program that addresses startup testing to be implemented prior to beginning the testing, and the proposed revision to Item c of License Condition 6 (evaluated above) would add the site-specific startup administrative manual to the items for which a schedule of availability would be provided to the NRC. The staff agrees that the combination of proposed License Condition 3 and proposed License Condition 6 (as revised) will accomplish the goal of the text that is currently in Item 14.4-3 of License Condition 2.

The text of Item 14.4-4 of License Condition 2 that is proposed to be deleted by the applicant's October 15, 2010, letter states that prior to initial fuel load, the licensee is responsible for review and evaluation of individual test results, as well as final review of overall test results and for review of selected milestones or hold points within the test phases. Test exceptions or results that do not meet acceptance criteria are identified to the affected and responsible design organizations, and corrective actions and retests are performed. The applicant stated that the proposed revision to License Condition 9 (which was initially proposed by the applicant in a letter dated June 18, 2010) also requires review and evaluation of individual test results, and that test exceptions or results that do not meet acceptance criteria are identified to the affected and responsible organizations, and corrective actions and retests, as required, are performed. The proposed revision would specifically add the review and evaluation of test

results for those tests conducted during preoperational testing and for those conducted during power ascension (i.e., above low-power testing (defined as less than 5 percent rated thermal power [RTP])) up to and including testing at 100 percent RTP. This condition would then cover the entire startup testing program and would be retitled as "Startup Program Test Results." The staff agrees that the proposed revisions to License Condition 9 will accomplish the goal of the text that is currently in Item 14.4-4 of License Condition 2. Proposed License Condition 9 is evaluated by the staff in Section 14.2.8 of this SER.

14.2.3.5 *Post Combined License Activities*

For the reasons discussed in the technical evaluation section above, the staff finds the following license conditions proposed by the applicant acceptable:

- License Condition (14-1) – No later than 12 months after issuance of the COL, the licensee shall submit to the Director of Office of New Reactors (NRO) a schedule that supports planning for and conduct of NRC inspections of the approved preoperational and startup procedures (including the site-specific startup administration manual). The schedule shall be updated every 6 months until the approved preoperational and startup procedures have been implemented. Prior to initiating the IT Program, the approved preoperational and startup procedures (including the site-specific startup administration manual) shall be available.

- License Condition (14-2) - Within one month of a change, any changes to the Initial Startup Test Program described in Chapter 14 of the VCSNS COL FSAR made in accordance with the provisions of 10 CFR 50.59 or Section VIII of Appendix D to 10 CFR Part 52 shall be reported in accordance with 10 CFR 50.59(d).

14.2.3.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the test specifications and procedures, and there is no outstanding information to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VCSNS COL FSAR is acceptable because it meets the requirements of 10 CFR 52.79(a)(28) and Criterion XI of Appendix B to 10 CFR Part 50. The staff based its conclusions on the following:

- STD COL 14.4-2 is acceptable because it provides an adequate description of the administrative controls for the development, review, and approval of individual test specifications and test procedures that will be implemented during the conduct of the initial test program and meets the guidance in NUREG-0800, Section 14.2.

- STD COL 14.4-3 is acceptable because it provides an adequate description of the administrative controls for the development of a site-specific administrative manual (procedure) that will be implemented during the conduct of each major phase of the initial test program and meets the guidance in NUREG-0800, Section 14.2.

- STD COL 14.4-4 is acceptable because it provides an adequate description of: 1) the administrative controls for the review, evaluation, and approval of test results by qualified personnel; and 2) the resolution of test exceptions or tests that do not meet the acceptance criteria during each major phase of the initial test program. In addition, this standard COL action item meets the guidance in NUREG-0800, Section 14.2 and RG 1.68.

- STD SUP 14.2-5 is acceptable because it provides an adequate description of the administrative controls for work and tagging requests that will be implemented during the conduct of the initial test program and meets the guidance in NUREG-0800, Section 14.2.

- STD SUP 14.2-6 is acceptable because it provides an adequate description of the administrative controls for system turnover in an orderly and well-coordinated manner during the conduct of the initial test program and meets the guidance in NUREG-0800, Section 14.2.

- STD SUP 14.2-7 is acceptable because it provides an adequate description of the administrative controls for plant modifications and repairs identified as a result of plant testing and meets the guidance in NUREG-0800, Section 14.2.

- STD SUP 14.2-8 is acceptable because it provides an adequate description of the administrative controls for corrective or preventive maintenance that will be implemented during the conduct of the initial test program and meets the guidance in NUREG-0800, Section 14.2.

14.2.4 Compliance of Test Program with Regulatory Guides

Section 14.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 14.2.4, "Compliance of Test Program with Regulatory Guides," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

14.2.5 Utilization of Operating Experience (Related to RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.8, "Utilization of Reactor Operating and Testing Experiences in Development of Test Program")

14.2.5.1 *Introduction*

The design, testing, startup, and OE from previous pressurized water reactor plants is utilized in the development of the initial preoperational and startup test program for the AP1000 plant. It is also the responsibility of the COL applicant to utilize the reactor operating and testing experience in different aspects of the testing program.

14.2.5.2 *Summary of Application*

Section 14.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 14.2 of the AP1000 DCD, Revision 19. Section 14.2 of the DCD includes Section 14.2.5.

In addition, in VCSNS COL FSAR Section 14.2.5 and in Part 10 of the application, the applicant provided the following:

Supplemental Information

- STD SUP 14.2-4

The applicant provided supplemental information to describe the utilization of operating experience in the development of plant administrative procedures.

License Conditions

- Part 10, License Condition 2, Item 14.4-6

The proposed license condition addresses first-plant-only and three-plant-only tests. In a letter dated November 16, 2010, the applicant endorsed the VEGP letter dated October 15, 2010, that proposed a revision to License Condition Item 14.4-6.

- Part 10, License Condition 7

In its letter dated August 25, 2010, the applicant endorsed the June 18, 2010, letter from the VEGP applicant, which proposed License Condition 7, providing additional details on first-plant-only and three-plant-only tests. In a letter dated November 16, 2010, the applicant endorsed the VEGP letter dated October 15, 2010, that proposed a revision to proposed License Condition 7.

14.2.5.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the utilization of operating and testing experience are given in Section 14.2 of NUREG-0800.

The applicable regulatory requirements for the information being reviewed in this section are 10 CFR 52.79(a)(28) and Criterion XI of Appendix B to 10 CFR Part 50. RG 1.68 provides guidance on how to comply with Criterion XI of Appendix B to 10 CFR Part 50.

14.2.5.4 *Technical Evaluation*

The NRC staff reviewed Section 14.2.5 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the utilization of operating and testing experience. The results of the

NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application. Any confirmatory items in the standard content material retain the numbers assigned in the VEGP SER.

The following portion of this technical evaluation section is reproduced from Section 14.2.5.4 of the VEGP SER:

Supplemental Information

- *STD SUP 14.2-4*

The applicant provided supplemental information to describe the utilization of operating experience in the development of plant administrative procedures.

STD SUP 14.2-4 was not in Revision 1 of the BLN FSAR and is addressed for the first time in this SER for the VEGP COL application. However, portions of the standard evaluation material in Section 14.2.5.4 of the BLN SER are directly applicable to the new STD SUP item identified in the VEGP FSAR. Therefore, the NRC staff used this evaluation material, identified below as standard content material, in the disposition of STD SUP 14.2-4.

Section 14.2.5 of the AP1000 DCD provided a summary overview of the administrative controls to be utilized for the development of preoperational and startup test programs for the AP1000 plant. As part of RAI 14.2-12, dated December 8, 2008, the NRC staff requested that the applicant supplement the BLN COL FSAR to describe how OE information will be used in developing and executing test procedures. In its January 22, 2009, response to the staff's RAI,

the applicant proposed to revise the information in Section 14.2.5 of the BLN COL FSAR. The response stated that administrative procedures will be used for the control and evaluation of OE information. Specifically, the response proposed the use of OE during test procedure preparation, including the sources and types of information reviewed. Sources of OE reported and described include NRC reports, Institute of Nuclear Power Operations reports, and Significant Operating Event Reports. The response stated that Section 14.2.5 of the BLN COL FSAR would include a summary of the principal conclusions from a review of operating and testing experiences at other reactor facilities and their effect on the applicant's test program.

The staff determined that the information proposed by the applicant describes an acceptable method for the consideration of reactor operating and testing experience, and discussed the principal conclusions from a review of operating and testing experience and its inclusion into the initial test program description, consistent with the guidance in RG 1.68 and RG 1.206. Therefore, the staff finds this change acceptable. The applicant will revise the BLN COL FSAR to include the proposed administrative controls. This is identified as ***Confirmatory Item 14.2-7****, pending NRC review and approval of the revised BLN COL FSAR.*

Resolution of Standard Content Confirmatory Item 14.2-7

The staff verified that the VEGP applicant has incorporated into its FSAR, in response to STD SUP 14.2-4, the proposed administrative controls identified as Confirmatory Item 14.2-7 in the staff's SER for the BLN COL. On this basis, Confirmatory Item 14.2-7 is resolved.

License Conditions

- *Part 10, License Condition 2, Item 14.4-6*

The following portion of this technical evaluation section is reproduced from Section 14.2.5.4 of the BLN SER:

In BLN COL FSAR, Part 10, "License Conditions and ITAAC," proposed License Condition 2, "COL Holder Items," the applicant proposed Item 14.4-6 to address first-plant-only and three-plant-only tests. The applicant stated that the COL holder for the first plant and the first three plants will perform the tests listed in Section 14.2.5 of the BLN COL FSAR. For subsequent plants, the COL applicant shall provide a justification that the results of the first-plant only tests or first-three-plant tests are applicable to the subsequent plant. In addition, COL holders referencing the results of the tests will provide the report prior to preoperational testing.

The staff reviewed the proposed license condition and determined that the applicant provided sufficient administrative controls for the performance of first-plant-only and three-plant-only tests, consistent with the guidance contained in RG 1.68, RG 1.206, and Section 14.2 of NUREG-0800. In addition, since test activities will not start until a facility is built, the staff determined that it is appropriate and acceptable for the COL holder to conduct these first-plant-only and three-plant-only tests during the post-COL phase (see Section 14.2.5.5).

Evaluation of Revised License Condition 2, Item 14.4-6

In a letter dated October 15, 2010, the VEGP applicant proposed a revision to License Condition 2, Item 14.4-6. Item 14.4-6 is considered unnecessary by the applicant as it can be adequately addressed by other proposed license conditions. The applicant proposed to replace the current text for Item 14.4-6 with, "Note - addressed by proposed License Conditions #7 and #9."

The text of Item 14.4-6 proposed to be deleted by the applicant's October 15, 2010, letter states the licensee(s) for the first plant and the first three plants will perform the tests listed in Section 14.2.5 of the VEGP COL FSAR. For subsequent plants, either tests listed in Section 14.2.5 shall be performed or the licensee shall provide a justification to the NRC, prior to fuel load, that the results of the first-plant-only tests or first-three-plant tests are applicable to the subsequent plant. The licensee(s) for the first AP1000 plant (or first-three-plants) will perform the tests defined during preoperational and startup testing as identified in Sections 14.2.9 and 14.2.10 of the VEGP COL FSAR.

The applicant stated that the October 15, 2010, proposed revisions to License Conditions 7 and 9 (both license conditions were initially proposed by the applicant in a letter dated June 18, 2010) adequately address the 3 parts of Item 14.4-6. Proposed License Condition 7 provides details on first-plant-only and three-plant-only tests and proposed License Condition 9 requires review and evaluation of individual test results, and that test exceptions or results that do not meet acceptance criteria are identified to the affected and responsible organizations, and corrective actions and retests, as required, are performed. The October 15, 2010, proposed revision to License Condition 9 would specifically add the review and evaluation of test results for those tests conducted during preoperational testing and for those conducted during power ascension (i.e., above low-power testing (<5 percent RTP) up to and including testing at 100 percent RTP). The October 15, 2010, proposed revision to License Condition 7 will address the written notifications for the pertinent testing.

The staff agrees that the proposed revisions to License Conditions 7 and 9 will accomplish the goal of the text that is currently in Item 14.4-6 of License Condition 2. Proposed License Condition 7 is evaluated by the staff later in this SER section. Proposed License Condition 9 is evaluated by the staff in Section 14.2.8 of this SER.

- *Part 10, License Condition 7*

In its letter dated June 18, 2010, as revised by letter dated October 15, 2010, the applicant proposed License Condition 7, providing additional details on first-plant-only and three-plant-only tests. Certain design features of the AP1000 plant will be subjected to special tests to establish unique phenomenological performance parameters of the AP1000 design. Because of the standardization of the AP1000 design, these special tests (designated as first-plant-only tests and first-three-plant-only tests) are not required on subsequent plants. These tests will be controlled through license conditions to ensure that relevant test results are reviewed, evaluated, and approved by the designated licensee

management before proceeding with the next testing phase. Accordingly, the applicant proposed the following license condition:

> *First-Plant-Only and First-Three-Plant-Only Testing*
>
> *A licensee shall provide written identification of the applicable references for documentation for the completion of the testing to the Director of the Office of New Reactors (or equivalent NRC management) within thirty (30) calendar days of the licensee confirmation of acceptable test results.*
>
> *Subsequent plant licensees crediting completion of testing by the first-plant or by the first-three plants shall provide a report referencing the applicable documentation identified by the first (or first three) plant(s) confirming the testing to the Director of the Office of New Reactors (or equivalent NRC management). This report shall be provided to NRC either prior to initiation of pre-operational testing, or within sixty (60) days of the identification of the documentation for the completion of the testing by the first plant (or third plant, as appropriate), whichever is later.*

The NRC staff reviewed the proposed license condition and concludes that it contains some of the necessary attributes to achieve sufficient oversight by licensee management and assure adequate and timely notification to the NRC. However, the NRC staff plans to impose additional conditions in the areas addressed by proposed License Condition 7 to ensure that the relevant requirements in Section 14.2 of the AP1000 DCD are met.

14.2.5.5 *Post Combined License Activities*

For the reasons discussed in the technical evaluation section above, the staff proposes to include the following license conditions:

- License Condition (14-3) -

  First-Plant-Only and First-Three-Plant-Only Testing

  The licensee shall notify the Director of the NRO in writing when it determines that it has completed the design-specific testing identified below and confirmed that the test results are within the range of acceptable values predicted or otherwise confirm that the tested systems perform their specific functions in accordance with the FSAR:

  (a) The licensee shall perform “first plant only” tests.
  (b) The licensee shall perform “first three plants” tests.

14.2.5.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff’s review confirmed that the applicant addressed the required information relating to the utilization of operating and testing experience, and there is no outstanding information to be addressed in

the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VCSNS COL FSAR is acceptable because it meets the requirements of 10 CFR 52.79(a)(28) and Criterion XI of Appendix B to 10 CFR Part 50. The staff based its conclusions on the following:

- STD SUP 14.2-4 is acceptable because it provides an adequate description of the administrative procedures that will be implemented to utilize operating experience in the development of plant administrative procedures during the conduct of the initial test program and meets the guidance in NUREG-0800, Section 14.2.

14.2.6 Use of Plant Operating and Emergency Procedures (Related to RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.9, "Trial Use of Plant Operating and Emergency Procedures")

14.2.6.1 *Introduction*

To the extent practicable throughout the preoperational and initial startup test program, test procedures utilize operating, emergency, and abnormal procedures where applicable in the performance of tests. The use of these procedures is intended to do the following:

1. Provide the specific procedure or illustrate changes that may be required.
2. Provide training of plant personnel in the use of these procedures.
3. Increase the level of knowledge of plant personnel on the systems being tested.

A testing procedure utilizing an operating, emergency, or abnormal procedure references the procedure directly, or extracts a series of steps from the procedure in a way that is optimal to accomplishing the above goals while efficiently performing the specified testing.

14.2.6.2 *Summary of Application*

Section 14.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 14.2 of the AP1000 DCD, Revision 19. Section 14.2 of the DCD includes Section 14.2.6.

In addition, in VCSNS COL FSAR Section 14.2.6, the applicant provided the following:

AP1000 COL Information Item

- STD COL 14.4-3

The applicant provided additional information in STD COL 14.4-3 to address COL holder responsibility for the development of a site-specific startup administrative manual (procedure) that will include the administrative procedures and requirements that will govern the activities associated with the plant's initial test program.

14.2.6.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the use of plant operating and emergency procedures are given in Section 14.2 of NUREG-0800.

The applicable regulatory requirements for the information being reviewed in this section are 10 CFR 52.79(a)(28) and Criterion XI of Appendix B to 10 CFR Part 50. RG 1.68 provides guidance on how to comply with Criterion XI of Appendix B to 10 CFR Part 50.

14.2.6.4 *Technical Evaluation*

The NRC staff reviewed Section 14.2.6 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to plant operating and emergency procedures. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 14.2.6.4 of the VEGP SER:

AP1000 COL Information Item

- *STD COL 14.4-3*

STD COL 14.4-3 was not explicitly evaluated in Section 14.2.6.4 of the BLN SER. However, the standard evaluation material in Section 14.2.6.4 of the BLN SER is directly applicable to this COL item. Therefore, the NRC staff used this evaluation material, identified below as standard content material, in the disposition of STD COL 14.4-3, as it relates to plant operating and emergency procedures.

Section 14.2.6 of the AP1000 DCD stated that plant normal, abnormal, and emergency operating procedures will be used when performing preoperational and startup tests. As part of RAI 14.2-12, dated December 8, 2008, the staff requested that the applicant supplement the information incorporated by reference and describe how, and to what extent, the plant operating, emergency, and surveillance procedures will be trial-tested during the initial test program. In its January 22, 2009, response to the staff's RAI, the applicant proposed a method to develop, trial-test, and correct plant operating and emergency procedures during the initial test program. The response stated that preoperational and start up test procedures, normal, abnormal, and emergency procedures, and alarm response procedures, will be verified, validated, and implemented. The response proposed to describe administrative measures for the trial use of procedures in human machine interface testing as part of the control room design finalization. The response also proposed that controls would include the development of operating and emergency procedures to support human factors engineering, operational task analysis, training simulator development, and verification and validation of procedures and training material.

The response also proposed to include Section 14.2.6.1, "Operator Training and Participation during Certain Initial Tests," in the BLN COL FSAR. The response proposed administrative controls that will provide for the participation of plant operators and shift crews in plant changes, off-normal events, test program schedule, and selected startup tests. The response also proposed measures to ensure that unexpected plant or system responses will be reviewed, evaluated, and their results factored into the operator training program. The response stated that the operator training program will satisfy the criteria described in TMI Action Plan Item I.G.1 of NUREG-0737.

The staff determined that the information proposed by the applicant describe an acceptable method for the trial use of plant operating, emergency, and surveillance procedures, consistent with the guidance in RG 1.68 and RG 1.206. Therefore, the staff finds this change acceptable. The applicant will revise the BLN COL FSAR to include the proposed administrative controls. This is identified as ***Confirmatory Item 14.2-8****, pending NRC review and approval of the revised BLN COL FSAR.*

Resolution of Standard Content Confirmatory Item 14.2-8

The staff verified that the VEGP applicant has incorporated into its FSAR the proposed administrative controls identified as Confirmatory Item 14.2-8 in the staff's SER for the BLN COL. On this basis, Confirmatory Item 14.2-8 is resolved.

14.2.6.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

14.2.6.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the use of plant operating and emergency procedures, and there is no outstanding information to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VCSNS COL FSAR is acceptable because it meets the requirements of 10 CFR 52.79(a)(28) and Criterion XI of Appendix B to 10 CFR Part 50. The staff based its conclusions on the following:

- STD COL 14.4-3 is acceptable because it provides an adequate description of the administrative measures for the trial use of plant operating, emergency, and surveillance procedures that will be implemented during the conduct of the initial test program and meets the guidance in NUREG-0800, Section 14.2 and RG 1.68.

14.2.7 Initial Fuel Loading and Initial Criticality

Section 14.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 14.2.7, "Initial Fuel Loading and Initial Criticality," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

14.2.8 Test Program Schedule (Related to RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.11, "Test Program Schedule")

14.2.8.1 *Introduction*

This section describes administrative controls for the development of a schedule, relative to the fuel loading date, for conducting each major phase of the test program. Each test required to be completed before initial fuel loading is identified.

14.2.8.2 *Summary of Application*

Section 14.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 14.2 of the AP1000 DCD, Revision 19. Section 14.2 of the DCD includes Section 14.2.8.

In addition, in VCSNS COL FSAR, Section 14.2.8, the applicant provided the following:

Supplemental Information

- STD SUP 14.2-1

The applicant provided supplemental information to address the site-specific initial test program schedule.

In addition, in Part 10 of the VCSNS COL application, the applicant provided the following:

License Conditions

- Part 10, License Condition 3

The proposed license condition addresses the initial test program implementation milestones.

- Part 10, License Condition 6

The proposed license condition addresses reporting requirements to the NRC regarding the initial test program.

- Part 10, License Condition 9

In its letter dated August 25, 2010, the applicant endorsed the June 18, 2010, letter from the VEGP applicant, which proposed License Condition 9, providing additional details on the power-ascension test phase. In a letter dated November 16, 2010, the applicant endorsed the VEGP letter dated October 15, 2010, that proposed a revision to License Condition 9.

14.2.8.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the test program schedule are given in Section 14.2 of NUREG-0800.

The applicable regulatory requirements for the information being reviewed in this section are 10 CFR 52.79(a)(28) and Criterion XI of Appendix B to 10 CFR Part 50. RG 1.68 provides guidance on how to comply with Criterion XI of Appendix B to 10 CFR Part 50.

14.2.8.4 *Technical Evaluation*

The NRC staff reviewed Section 14.2.8 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the

complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the test program schedule. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application. Any confirmatory items in the standard content material retain the numbers assigned in the VEGP SER.

The following portion of this technical evaluation section is reproduced from Section 14.2.8.4 of the VEGP SER:

Supplemental Information

- *STD SUP 14.2-1*

The applicant provided supplemental information to address the site-specific initial test program schedule.

The following portion of this technical evaluation section is reproduced from Section 14.2.8.4 of the BLN SER:

Test Program Schedule

As part of RAI 14.2-12, dated December 8, 2008, the staff requested that the applicant supplement the information incorporated by reference and describe the methodology that will be used to develop a schedule for conducting each major phase of the initial test program and for the development of test procedures. In its January 22, 2009, response to the staff's RAI, the applicant proposed to

include information that further describes the administrative controls that will be used to develop a test program schedule. The applicant proposed controls for the development of a site-specific schedule that will address each major phase of the test program and will consider the organizational impact on overlapping test program schedules for multi-unit sites. The applicant also discussed the administrative measures in the startup administrative manual related to the test procedure development schedule and the initial test program schedule. The applicant proposed specific controls for the development of detailed plant operating and emergency procedures, the availability of approved test procedures for review by NRC inspectors, and for the notification to the NRC of changes to approved test procedures. The response also stated that schedule milestones for the development of plant operating procedures are presented in Table 13.4-201 of the BLN COL FSAR. Finally, the response stated that operating and emergency procedures will be available for use both prior to the start of licensed operator training as well as during the initial test program implementation.

The staff determined that the information proposed by the applicant described the methodology that will be used to develop a schedule, relative to the fuel loading date, for conducting each major phase of the test program, and for the development of test procedures, consistent with the guidance in RG 1.68 and RG 1.206. Therefore, the staff finds this change acceptable. The applicant will revise the BLN COL FSAR to include the proposed administrative controls. This is identified as ***Confirmatory Item 14.2-9****, pending NRC review and approval of the revised BLN COL FSAR.*

Operational Programs Required by the Regulations

In Section 13.4, Table 13.4-201, of the BLN COL FSAR, the applicant provided information to address the implementation of operational programs. The applicant identified the initial test program as an operational program and provided implementation milestones for each major phase of the test program. Additionally, the applicant stated that the initial test program will be implemented in three phases, namely the construction test program phase, the preoperational test program phase, and the startup test program phase. The construction test program phase will start prior to the first construction test being conducted. It will be followed by the preoperational test phase, which will start prior to the first preoperational test. Finally, the startup test phase is identified, and the applicant stated that it will start prior to initial fuel load. The staff reviewed the proposed milestones and determined that they adequately describe the implementation of each major phase of the initial test program and are, therefore, acceptable.

Resolution of Standard Content Confirmatory Item 14.2-9

The staff verified that the VEGP applicant has incorporated into its FSAR, in response to STD SUP 14.2-1, the proposed administrative controls identified as Confirmatory Item 14.2-9 in the staff's SER for the BLN COL. On this basis, Confirmatory Item 14.2-9 is resolved.

License Conditions

- *Part 10, License Conditions 3 and 6*

The following portion of this technical evaluation section is reproduced from Section 14.2.8.4 of the BLN SER:

In Part 10 of the BLN COL FSAR, License Condition 3, "Operational Program Implementation," the applicant proposed a license condition for the implementation of operational programs as described in Table 13.4-201 of the FSAR. This license condition included implementation milestones for the initial test program, namely E.1, F.1, and H.1. Specifically:

- *Milestone E.1 states that for construction testing, the licensee will implement the construction testing phase of the initial test program prior to the first construction test being conducted.*

- *Milestone F.1 states that for preoperational testing, the licensee will implement the preoperational testing phase of the initial test program prior to the first preoperational test being conducted.*

- *Milestone H.1 states that for startup testing, the licensee will implement the startup testing phase prior to initial fuel load.*

In Part 10 of the BLN COL FSAR, proposed License Condition 6, "Operational Program Readiness," the applicant states:

The licensee shall submit to the appropriate Director of the NRC, a schedule, no later than 12 months after issuance of the COL, that supports planning for and conduct of the NRC inspection of the operational programs listed in the operation program FSAR Table 13.4-201. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until either the operation programs in the FSAR table have been fully implemented or the plant has been placed in commercial service.

The staff reviewed the BLN COL FSAR Table 13.4-201, and notes that the initial test program is listed as an operational program.

The staff determined that the proposed license conditions adequately describe the implementation of each major phase of the initial test program, consistent with the guidance contained in RG 1.68, RG 1.206, and Section 14.2 of NUREG-0800. In addition, since test activities will not start until a facility is built; the staff determined that it is appropriate and acceptable for the COL holder to submit a schedule, which will contain implementation details of operational programs, during the post-COL phase (see Section 14.2.8.5).

- *Part 10, License Condition 9*

Certain milestones within the startup testing phase of the initial test program (i.e., pre-critical testing, criticality testing, and low-power testing) will need to be

controlled through license conditions to ensure that relevant test results are reviewed, evaluated, and approved by the designated licensee management before proceeding with the power ascension test phase.

In its second letter dated June 18, 2010[20], as revised by letter dated October 15, 2010, the applicant proposed License Condition 9, providing additional detail on the power-ascension test phase. Specifically, the applicant proposed the following license condition:

Pre-operational Testing

Following completion of pre-operational testing, the licensee shall review and evaluate individual test results. Test exceptions or results which do not meet acceptance criteria are identified to the affected and responsible organizations, and corrective actions and retests, as required, are performed.

Pre-critical and Criticality Testing

1. *Following completion of pre-critical and criticality testing, the licensee shall review and evaluate individual test results. Test exceptions or results which do not meet acceptance criteria are identified to the affected and responsible organizations, and corrective actions and retests, as required, are performed.*

2. *The licensee shall provide written notification to the Director of the Office of New Reactors (or equivalent NRC management) within fourteen (14) calendar days of completion of the pre-critical and criticality testing.*

Low-Power (<5% RTP) Testing

1. *Following completion of low-power testing (<5% RTP), the licensee shall review and evaluate individual test results. Test exceptions or results which do not meet acceptance criteria are identified to the affected and responsible organizations, and corrective actions and retests, as required, are performed.*

2. *The licensee shall provide written notification to the Director of the Office of New Reactors (or equivalent NRC management) within fourteen (14) calendar days of completion of the low power testing.*

At-Power (5%-100% RTP) Testing

1. *Following completion of at-power testing (at or above 5% RTP up to and including testing at 100% RTP), the*

[20] The first letter dated June 18, 2010, provided proposed License Condition 7, which is evaluated in Section 14.2.5 of this SER.

licensee shall review and evaluate individual test results. Test exceptions or results which do not meet acceptance criteria are identified to the affected and responsible organizations, and corrective actions and retests, as required, are performed.

2. *The licensee shall provide written notification to the Director of the Office of New Reactors (or equivalent NRC management) within fourteen (14) calendar days of completion of the at-power testing.*

The NRC staff reviewed the proposed license condition and concludes that it contains some of the necessary attributes to achieve sufficient oversight by licensee management and assure adequate and timely notification to the NRC. However, the NRC staff plans to impose additional conditions in the areas addressed by proposed License Condition 9 to ensure that the relevant guidance of RG 1.68 and the relevant requirements of Criterion XI of Appendix B to 10 CFR Part 50 are met.

14.2.8.5 *Post Combined License Activities*

For the reasons discussed in the technical evaluation section above, the staff proposes to include the following license conditions:

- License Condition (14-4) - The licensee shall implement the initial test program (applicable portions) on or before the associated milestones identified below:

    1. Construction Testing - Prior to initial construction testing
    2. Preoperational Testing - Prior to initial preoperational testing
    3. Startup Testing - Prior to initial fuel load

- License Condition (14-5) – No later than 12 months after issuance of the COL, the licensee shall submit to the Director of NRO a schedule that supports planning for and conduct of NRC inspections of the Operational Program (initial test program). The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until this operational program (ITP) has been fully implemented.

- License Condition (14-6) -

    <u>Pre-operational Testing</u>

    Following completion of pre-operational testing, the licensee shall review and evaluate individual test results and confirm the test results are within the range of acceptable values predicted or otherwise confirm that the tested systems perform their specific functions in accordance with the FSAR.

    <u>Pre-critical and Criticality Testing</u>

    1. Following completion of pre-critical and criticality testing, the licensee shall review and evaluate individual test results and confirm the test results are within the range

of acceptable values predicted or otherwise confirm that the tested systems perform their specific functions in accordance with the FSAR.

2. The licensee shall provide written notification to the Director of the NRO upon completion of pre-critical and criticality testing. Upon submission of this notification, the licensee is authorized to perform low-power testing as described in the FSAR and operate the facility at reactor steady-state core power levels, not in excess of 170 megawatts thermal (5-percent power), in accordance with the conditions specified herein.

Low-Power (<5% RTP) Testing

1. Following completion of low-power testing (<5% RTP), the licensee shall review and evaluate individual test results and confirm that the test results are within the range of acceptable values predicted or otherwise confirm that the tested systems perform their specific functions in accordance with the FSAR.

2. The licensee shall provide written notification to the Director of the NRO upon completion of low power testing. Upon submission of this notification, the licensee is authorized to perform power ascension testing as described in the FSAR and operate the facility at reactor steady-state core power levels, not in excess of 3400 megawatts thermal (100 percent power), in accordance with the conditions specified herein.

At-Power (5%-100% RTP) Testing

1. Following completion of at-power testing (at or above 5% RTP up to and including testing at 100% RTP), the licensee shall review and evaluate individual test results and confirm that the results are within the range of acceptable values predicted or otherwise confirm that the tested systems perform their specific functions in accordance with the FSAR.

2. The licensee shall provide written notification to the Director of the NRO upon completion of the at-power testing.

14.2.8.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the test program schedule, and there is no outstanding information to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VCSNS COL FSAR is acceptable because it meets the requirements of 10 CFR 52.79(a)(28) and Criterion XI of Appendix B to 10 CFR Part 50. The staff based its conclusions on the following:

- STD SUP 14.2-1 is acceptable because it provides an adequate description of the administrative measures for the development of a site-specific initial test program schedule and meets the guidance in NUREG-0800 Section 14.2 and RG 1.68.

14.2.9 Preoperational Test Descriptions (Related to RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.12, "Individual Test Descriptions")

14.2.9.1 *Introduction*

This section includes test abstracts for each individual test conducted during the initial test program. The abstracts: (1) identify each test by title; (2) specify the prerequisites and major plant operating conditions necessary for each test (such as power level and mode of operation of major control systems); (3) provide a summary description of the test objectives and method, significant parameters, and plant performance characteristics to be monitored; and (4) provide a summary of the acceptance criteria established for each test to ensure that the test verifies the functional adequacy of the SSCs involved in the test. The abstracts also include sufficient information to justify the specified test method if such method does not subject the SSC under test to representative design operating conditions. In addition, the abstracts identify pertinent precautions for individual tests, as necessary (e.g., minimum flow requirements or reactor power level that must be maintained).

14.2.9.2 *Summary of Application*

Section 14.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 14.2 of the AP1000 DCD, Revision 19. Section 14.2 of the DCD includes Section 14.2.9.

In addition, in VCSNS COL FSAR, the applicant provided the following:

AP1000 COL Information Items

- STD COL 14.4-5

The applicant provided additional information in STD COL 14.4-5 to address interface requirements.

- STD COL 3.9-5

The applicant provided additional information in STD COL 3.9-5 to address initial testing of the pressurizer surge line piping.

Supplemental Information

- STD SUP 14.2-2

The applicant provided additional information in STD SUP 14.2-2 to address the development of administrative procedures that will be implemented during the preoperational testing activities.

14.2.9.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the preoperational test descriptions are given in Section 14.2 of NUREG-0800.

The applicable regulatory requirements for the information being reviewed in this section are 10 CFR 52.79(a)(28) and Criterion XI of Appendix B to 10 CFR Part 50. RG 1.68 provides guidance on how to comply with Criterion XI of Appendix B to 10 CFR Part 50.

14.2.9.4 *Technical Evaluation*

The NRC staff reviewed Section 14.2.9 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the preoperational test descriptions. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application. Any confirmatory items in the standard content material retain the numbers assigned in the VEGP SER.

The following portion of this technical evaluation section is reproduced from Section 14.2.9.4 of the VEGP SER:

> *AP1000 COL Information Items*
>
> - *STD COL 14.4-5*
>
> *The NRC staff reviewed STD COL 14.4-5 related to COL Information Item 14.4-5, which addresses interface requirements. The applicant provided additional information in Sections 14.2.9 and 14.2.10 of the VEGP COL FSAR to address COL Information Item 14.4-5. COL Information Item 14.4-5 states:*

The Combined License applicant is responsible for testing that may be required of structures and systems which are outside the scope of this design certification. Test Specifications and acceptance criteria are provided by the responsible design organizations as identified in subsection 14.2.3 [of the AP1000 DCD]. The interfacing systems to be considered for testing are taken from Table 1.8-1 [of the AP1000 DCD] and include as a minimum, the following:

- *Storm drains*
- *Site specific seismic sensors*
- *Offsite [alternating current] ac power systems*
- *Circulating water heat sink*
- *Raw and sanitary water systems*
- *Individual equipment associated with the fire brigade*
- *Portable personnel monitors and radiation survey instruments*
- *Equipment associated with the physical security plan*

The commitment was also captured as COL Action Item 14.4-5 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

The COL applicant is responsible for testing that may be required of structures and systems that are outside the scope of the design certification.

The following portion of this technical evaluation section is reproduced from Section 14.2.9.4 of the BLN SER. Some of the text in the BLN SER associated with STD COL 14.4-5 has been relocated to the evaluation of STD SUP 14.2-2, as discussed below.

In its review of the information provided by the applicant to address COL Information Item 14.4-5, the staff noted that the seismic monitoring system testing described in Section 14.2.9.4.15 of the AP1000 DCD also applies to the site-specific seismic sensors.

The applicant also provided information regarding the following systems:

- *storm drains (Section 14.2.9.4.22)*
- *offsite ac power systems (Section 14.2.9.4.23)*
- *raw water systems (Section 14.2.9.4.24)*
- *sanitary drainage system (Section 14.2.9.4.25)*
- *fire brigade support equipment (Section 14.2.9.4.26)*
- *portable personnel monitors and radiation survey instruments (Section 14.2.9.4.27)*
- *cooling tower(s) (Section 14.2.10.4.29)*

The staff notes that information provided relative to equipment associated with the Physical Security Plan will be reviewed in Chapter 13 of this SER.

As part of RAI 14.2-1, the staff requested that the applicant provide additional information in the test abstract related to the offsite ac power systems. Specifically, Section 14.2.9.4.23 of the BLN COL FSAR states that the offsite ac power system components undergo a series of individual component and integrated system preoperational tests to verify that the offsite ac power system performs in accordance with the associated component design specifications. The individual component and integrated tests include:

a. *Availability of ac and direct current (dc) power to the switchyard equipment is verified.*

b. *Operation of high voltage (HV) circuit breakers is verified.*

c. *Operation of HV disconnect switches and ground switches is verified.*

d. *Operation of substation transformers is verified.*

e. *Operation of current transformers, voltage transformers, and protective relays is verified.*

f. *Operation of switchyard equipment controls, metering, interlocks, and alarms that affect plant offsite ac power system performance is verified.*

g. *Design limits of switchyard voltages and stability are verified.*

h. *Under simulated fault conditions, proper function of alarms and protective relaying circuits is verified.*

The staff asked in its RAI that the above list should include the following items:

- *Operation of instrumentation and control alarms used to monitor switchyard equipment status*

- *Proper operation and load carrying capability of breakers, switchgear, transformers, and cables*

- *Proper operation of the automatic transfer capability of the preferred power supply to the maintenance power supply through the reserve auxiliary transformer*

- *Operation of main generator in islanding mode is verified to ensure that the onsite power system equipment including the Class 1E battery chargers and uninterruptible power supplies can withstand the voltage spike from the generator following isolation from the grid.*

- *Switchyard interface agreement and protocols are verified.*

The staff requested that the applicant revise Section 14.2.9.4.23 to include the above items, or justify their exclusion.

In its June 26, 2008, response to RAI 14.2-1, the applicant agreed to add the above tests to BLN COL FSAR Section 14.2.9.4.23, except for verifying the proper operation of the generator in islanding mode. The applicant stated that this islanding mode test does not belong to this BLN COL FSAR section. This test is specified by Westinghouse as a load rejection test from 100 percent power in AP1000 DCD Section 14.2.10.4.21. That section will verify proper operation of equipment utilized in the generator islanding mode by a combination of the purchase specifications for the equipment and verification of satisfactory performance after the load reject test from 100 percent power. The applicant proposed to revise BLN COL FSAR Chapter 14, Section 14.2.9.4.23 by adding the following to the end of the existing Section 14.2.9.4.23 in the sequence indicated:

i. Operation of instrumentation and control alarms used to monitor switchyard equipment status.

j. Proper operation and load carrying capability of breakers, switchgear, transformers, and cables, and verification of these items by a non-testing means such as a [quality control] QC nameplate check of as-built equipment where testing would not be practical or feasible.

k. Verification of proper operation of the automatic transfer capability of the preferred power supply to the maintenance power supply through the reserve auxiliary transformer.

l. Switchyard interface agreement and protocols are verified.

With the addition of above offsite ac power system tests to the existing Section 14.2.9.4.23, the staff finds that the offsite ac power system testing performed under BLN COL FSAR Chapter 14, Section 14.2.9.4.23 will demonstrate the energization and proper operation of the as-installed switchyard components. In addition, the staff concurs with the applicant that verification of proper operation of the generator in islanding mode is part of AP1000 DCD Section 14.2.10.4.21, "100 Percent Load Rejection." Therefore, the staff finds the applicant's response acceptable. This is ***Confirmatory Item 14.2-11****, pending NRC review and approval of the revised BLN COL FSAR.*

As part of RAI 14.2-2, the staff also requested that the applicant provide additional information to the test abstract related to the offsite ac power systems. The staff stated that the AP1000 DCD provides interface requirements for the transmission switchyard and onsite power system in accordance with 10 CFR 52.79(b). Specifically, Summary Table 1.8-1, "Plant Interfaces with the Remainder of Plant," requires the COL applicant to address offsite ac requirements (Item 8.2) for steady-state load, inrush kVA for motors, nominal voltage, allowable voltage regulation, nominal allowable frequency fluctuation, maximum frequency decay rate, and limiting under-frequency value for the reactor coolant pump (RCP). It further requires the offsite transmission system analysis (Item 8.3) for loss of the AP1000 unit or the largest unit, for voltage operating range, for maintaining transient stability, and for the RCP bus voltage to remain above the voltage required to maintain the flow assumed in Chapter 15

analyses for a minimum of three seconds following a turbine trip. The staff requested that the applicant discuss how the preoperational test performed under Section 14.2.9.4.23 (General Test Methods and Acceptance Criteria) for BLN verifies all requirements cited in Sections 8.2 and 8.3 of the AP1000 DCD.

In its June 26, 2008, response to RAI 14.2-2, the applicant stated that site interface requirements in AP1000 DCD Table 1.8-1, Items 8.2 (offsite ac requirements) and 8.3 (offsite transmission system and stability analyses) are verified not just by BLN COL FSAR Section 14.2.9.4.23 (preoperational test for offsite ac power systems) alone, but a combination of analyses and testing as described below:

- *The site interface parameters identified in AP1000 DCD Table 1.8-1, Items 8.2 and 8.3, as provided by Westinghouse, are used as input parameters or acceptance criteria in the Grid Stability Analysis performed.*

- *The Offsite AC Power Systems tests detailed in BLN COL FSAR Section 14.2.9.4.23, as modified by the applicant's response to RAI 14.2-1, require specific preoperational testing of as-installed switchyard components as described in BLN COL FSAR Section 8.2 to demonstrate proper operation of the design capabilities and protective features of those components.*

- *The tests detailed in AP1000 DCD Section 14.2.9.4.21, Main, Unit Auxiliary and Reserve Auxiliary Transformer Test, demonstrate the energization of the transformers and the proper operation of associated protective relaying, alarms, and control devices.*

- *The tests detailed in AP1000 DCD Section 14.2.9.2.15, Main AC Power System Testing, verify power availability to support proper operation of required electrical loads.*

- *The 100 percent load reject test described in AP1000 DCD Section 14.2.10.4.21 provides for an integrated plant response and verification of the demands placed on the electrical distribution system when the plant is separated from the grid.*

The staff has reviewed BLN COL FSAR Section 14.2.9.4.23 and AP1000 DCD Sections 14.2.9.4.21, 14.2.9.2.15, and 14.2.10.4.21 cited by the applicant for proper operation of components and the interface parameters required for the grid stability and offsite transmission system analyses. The staff concurs with the applicant that the site interface requirements in AP1000 DCD Table 1.8-1, Items 8.2 and 8.3 can be verified by the combination of analyses and testing described above. Therefore, the NRC staff finds the applicant's response to be acceptable. This resolves RAI 14.2-2.

In RAI 14.2-9, the staff requested that the applicant provide additional information in the test abstract related to the fire brigade support equipment test abstract in Section 14.2.9.4.26 of the BLN COL FSAR. Specifically, RG 1.189, Regulatory Position 3.4.2, Hydrants and Hose Houses, states that "threads compatible with

those used by local fire departments should be provided on all hydrants, hose couplings, and standpipe risers. Alternatively, a sufficient number of hose thread adapters may be provided." The importance of ensuring that installed plant fire equipment be compatible with the equipment used by local fire departments warrants the inclusion of installed plant fire equipment (hydrants, hoses, couplings, and standpipe risers) in the initial test program to verify either the compatibility of threads or the provision of an adequate supply of hose thread adaptors that will be readily available in the event of a fire. The staff requested that the applicant revise Section 14.2.9.4.26 to address this issue. In addition, with respect to BLN COL FSAR Section 14.2.9.4.26(c), the staff requested that the applicant specifically identify any portable "communication equipment" that is credited for fire brigade use. In a letter dated June 30, 2008, the applicant proposed to add the requirement to verify fire equipment hose thread compatibility in Section 14.2 in a future revision of the BLN COL FSAR. The staff confirmed that the applicant addressed the relevant information in Revision 1 of the BLN COL FSAR, and there is no outstanding information expected to be addressed related to this section. This resolves RAI 14.2-9.

In RAI 12.3-12.4-5, the staff requested that the applicant provide additional information related to the portable personnel monitors and radiation survey instruments test abstract contained in Section 14.2.9.4.27 of the BLN COL FSAR. Specifically, the staff requested the applicant to provide information regarding the accuracy and overall performance of portable survey instruments addressed in standard ANSI N42.17A-1989, and information related to the calibration and maintenance of portable radiation survey instruments addressed in ANSI N323A-1997. The staff also requested that the applicant revise Section 14.2 of the BLN COL FSAR to address this issue. In a letter dated September 22, 2008, the applicant proposed to revise Section 14.2.9.4.27 by providing additional text to the general method and acceptance criteria. Specifically, the applicant proposed that the portable monitors and instrument test shall include provisions for verifying proper functioning of monitors and instruments to respond to radiation as required and proper operatability [sic] *of instrumentation controls, battery, and alarms as applicable. Further, the applicant proposed to revise Appendix 1AA to Chapter 1, to include the updated version of ANSI N323A cited in the exception to Regulatory Guide 8.6. The staff reviewed the applicant's response and found the proposed changes acceptable. Further, the staff confirmed that the applicant addressed the relevant information in Revision 1 of the BLN COL FSAR, and there is no outstanding information expected to be addressed related to this section. This resolves RAI 12.3-12.4-5.*

Resolution of Standard Content Confirmatory Item 14.2-11

The staff verified that the VEGP applicant has incorporated into its FSAR the proposed administrative controls identified as Confirmatory Item 14.2-11 in the staff's SER for the BLN COL. On this basis, Confirmatory Item 14.2-11 is resolved.

- *STD COL 3.9-5*

In a letter dated July 2, 2010 and supplemented by letter dated August 6, 2010, the VEGP applicant identified changes to be made to VEGP COL FSAR

Section 14.2.9 involving the initial testing of the pressurizer surge line piping. This COL item is primarily addressed in Section 3.9.3 of the VEGP COL FSAR and that portion is reviewed by the NRC staff in Section 3.12 of this SER. The portion of STD COL 3.9-5 addressed in FSAR Section 14.2, and evaluated in this SER section, is the discussion of the test abstract to identify the standard operating conditions for surge line thermal monitoring instrumentation verification and data gathering that complies with NRC Bulletin 88-11, "Pressurizer Surge Line Thermal Stratification." The staff notes that this proposed testing is to be done on the first AP1000 unit placed in operation.

The NRC staff has compared the purpose, prerequisites, and general test methods and acceptance criteria provided by the VEGP applicant in the test abstract for the pressurizer surge line piping, to the guidance in NRC Bulletin 88-11. The staff concludes that sufficient information on the test procedure has been provided to assure that the test results will quantify the extent of thermal stratification, thermal stripping and piping deflections, as recommended in Bulletin 88-11. Therefore, the staff finds that the portion of STD COL 3.9-5 relevant to the preoperational testing of the pressurizer surge line piping to be acceptable. The incorporation of the planned changes to the VEGP COL FSAR will be tracked as ***VEGP Confirmatory Item 14.2-2****.*

Resolution of VEGP (Standard Content) Confirmatory Item 14.2-2

VEGP Confirmatory Item 14.2-2 is an applicant commitment to revise its FSAR to specify surge line monitoring test procedures. The staff verified that the VEGP COL FSAR was appropriately updated. As a result, VEGP Confirmatory Item 14.2-2 is now closed. The applicant indicated that the proposed changes to its FSAR are expected to be standard for the subsequent COL applicants. Since Confirmatory Item 14.2-2 already exists as a standard confirmatory item in this SER, the staff designated this standard confirmatory item as VEGP Confirmatory Item 14.2-2.

Supplemental Information

- *STD SUP 14.2-2*

The applicant provided additional information in STD SUP 14.2-2 to address the development of administrative procedures that will be implemented during the preoperational testing activities.

STD SUP 14.2-2 was not in Revision 1 of the BLN FSAR and is addressed for the first time in this SER for the VEGP COL application. However, portions of the standard evaluation material in Section 14.2.9.4 of the BLN SER are directly applicable to the new STD SUP item identified in the VEGP FSAR. Therefore, the NRC staff used this evaluation material, identified below as standard content material, in the disposition of STD SUP 14.2-2.

As part of the response to RAI 14.2-12, the applicant proposed to supplement Section 14.2.9 of the AP1000 DCD, Revision 17, with additional administrative controls that will be implemented during preoperational testing activities. The response stated that the control of systems that need to be returned to the

construction organization for modifications, repairs, or to correct a new problem will be through administrative procedures. These procedures will also provide directions for the following activities:

- *Release control of systems and/or components to construction*
- *Documentation of the actual work performed and the impact on testing*
- *Identification of required testing to restore the system to an identified status (operability, functionality, availability), as well as the identification of re-performance tests based on the impact of the work performed*
- *Authorizations and tracking of operability and unavailability determinations*
- *Verification activities to ensure that retests stay in compliance with ITAAC commitments*

The staff reviewed this supplemental information related to preoperational test descriptions and determined that it provided adequate administrative controls for an orderly turnover of plant systems when these have to be returned to the construction organization. Therefore, the staff finds this information acceptable. The applicant will revise the BLN COL FSAR to include the proposed administrative controls. This is identified as ***Confirmatory Item 14.2-10****, pending NRC review and approval of the revised BLN COL FSAR.*

Resolution of Standard Content Confirmatory Item 14.2-10

The staff verified that the VEGP applicant has incorporated into its FSAR, in response to STD SUP 14.2-2, the proposed administrative controls identified as Confirmatory Item 14.2-10 in the staff's SER for the BLN COL. On this basis, Confirmatory Item 14.2-10 is resolved.

14.2.9.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

14.2.9.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the preoperational test descriptions, and there is no outstanding information to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes, that the information presented in the VCSNS COL FSAR is acceptable because it meets the requirements of 10 CFR 52.79(a)(28) and Criterion XI of Appendix B to 10 CFR Part 50. It also meets the guidance in NUREG-0800 Section 14.2 and RG 1.68.

The staff based its conclusions on the following:

- STD COL 14.4-5 is acceptable because it provides an adequate description of testing of structures and systems that are outside the scope of the DC.

- STD COL 3.9-5, as it applies to the test abstract for the surge line thermal monitoring, is acceptable because it provides assurance that the test results will quantify the extent of thermal stratification, thermal stripping and piping deflections, as recommended in Bulletin 88-11.

- STD SUP 14.2-2 is acceptable because it provides an adequate description for the development of administrative controls that will be implemented during the preoperational testing activities.

14.2.10 Startup Test Procedures (Related to RG 1.206, Section C.III.1, Chapter 14, C.I.14.2.12, "Individual Test Descriptions")

14.2.10.1 *Introduction*

Startup test procedures address the tests that comprise the startup phase of the test program. For each test, a general description is provided for test objective, test prerequisites, test description, and test performance criteria, where applicable. In describing a test, the operating and safety-related characteristics of the plant to be tested and evaluated are identified. Where applicable, the relevant performance criteria for the test are discussed. Some of the criteria relate to the value of process variables assigned in the design or analysis of the plant, component systems, and associated equipment. Other criteria may be associated with expectations relating to the performance of systems.

14.2.10.2 *Summary of Application*

Section 14.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 14.2 of the AP1000 DCD, Revision 19. Section 14.2 of the DCD includes Section 14.2.10.

In addition, in VCSNS COL FSAR Section 14.2.10, the applicant provided the following:

AP1000 COL Information Item

- STD COL 14.4-5

The applicant provided additional information in STD COL 14.4-5 to address interface requirements. This COL item is evaluated by the staff in Section 14.2.9 of this SER.

Supplemental Information

- STD SUP 14.2-3

The applicant provided additional information in STD SUP 14.2-3 to address the development of administrative controls that will be implemented during power ascension testing activities.

14.2.10.3 *Regulatory Basis*

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the startup test procedures are given in Section 14.2 of NUREG-0800.

The applicable regulatory requirements for the information being reviewed in this section are 10 CFR 52.79(a)(28) and Criterion XI of Appendix B to 10 CFR Part 50. RG 1.68 provides guidance on how to comply with Criterion XI of Appendix B to 10 CFR Part 50.

14.2.10.4 *Technical Evaluation*

The NRC staff reviewed Section 14.2.10 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the startup test procedures. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 14.2.10.4 of the VEGP SER:

Supplemental Information

- *STD SUP 14.2-3*

The applicant provided additional information in STD SUP 14.2-3 to address the development of administrative controls that will be implemented during power ascension testing activities.

STD SUP 14.2-3 was not in Revision 1 of the BLN FSAR and is addressed for the first time in this SER for the VEGP COL application. However, the standard evaluation material in Section 14.2.9.4 of the BLN SER is directly applicable to the new STD SUP item identified in the VEGP FSAR. Therefore, the NRC staff used this evaluation material, identified below as standard content material, in the disposition of STD SUP 14.2-3.

As part of the response to RAI 14.2-12, the applicant proposed supplemental information in Section 14.2.10 of the BLN COL FSAR, with additional administrative controls that will be implemented during power ascension testing activities consistent with the guidance in RG 1.68 and NUREG-0800. The applicant proposed to discuss a power ascension test plan that will provide controls for operations during the power ascension test phase, including the following:

- *Verification of core performance parameters*
- *Verification of adequate calibration of nuclear instrumentation*
- *Controls for high flux trips consistent with TS requirements*
- *Conduct of surveys of plant systems and equipment*
- *Checks for unexpected radioactivity in process systems and effluents*
- *Perform reactor coolant leak checks*
- *Controls for reviews of testing at each power plateau*

Additionally, the applicant proposed to provide controls for the extrapolation of tests at lower power levels in order to determine the acceptability of performing the test at higher power levels. The applicant proposed to describe measures for the use of surveillance test procedures to document portions of tests, and the use of initial test program tests to satisfy TS surveillance requirements.

The staff reviewed this proposed supplemental information related to the power ascension test phase and determined that it provided adequate administrative controls for activities during power ascension testing. Therefore, the staff finds this information acceptable. The applicant will revise the BLN COL FSAR to include the proposed administrative controls. This is identified as ***Confirmatory Item 14.2-12****, pending NRC review and approval of the revised BLN COL FSAR.*

Resolution of Standard Content Confirmatory Item 14.2-12

The staff verified that the VEGP applicant has incorporated into its FSAR, in response to STD SUP 14.2-3, the proposed administrative controls identified as Confirmatory Item 14.2-12 in the staff's SER for the BLN COL. On this basis, Confirmatory Item 14.2-12 is resolved.

14.2.10.5 *Post Combined License Activities*

There are no post-COL activities related to this section.

14.2.10.6 *Conclusion*

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the startup test procedures, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VCSNS COL FSAR is acceptable because it meets the requirements of 10 CFR 52.79(a)(28) and Criterion XI of Appendix B to 10 CFR Part 50. The staff based its conclusions on the following:

- STD SUP 14.2-3 is acceptable because it provides an adequate description of the administrative controls associated with the activities that will be implemented during the power ascension testing phase of the initial test program and meets the guidance in NUREG-0800 Section 14.2 and RG 1.68.

14.3 Certified Design Material (Related to RG 1.206, Section C.III.1, Chapter 14, C.I.14.3, "Inspections, Tests, Analyses, and Acceptance Criteria")

14.3.1 Introduction

This section addresses the selection criteria and processes used to develop the VCSNS Certified Design Materials (CDMs). It specifically addresses the site-specific inspections, tests, analyses, and acceptance criteria (SS-ITAAC). The COL applicant provides its proposed selection methodology and criteria for establishing the ITAAC that are necessary and sufficient to provide reasonable assurance that the facility has been constructed and will be operated in conformity with the license and the Commission's rules and regulations.

The applicant proposes, in addition to the ITAAC incorporated by reference from the AP1000 DCD, SS-ITAAC to provide reasonable assurance that the facility has been constructed and will operate in conformance with the applicable regulations.

14.3.2 Summary of Application

Section 14.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 14.3 of the AP1000 DCD, Revision 19. The advanced safety evaluation with confirmatory items for Section 14.3.2 was based on the VCSNS COL FSAR, Revision 2 and DCD Revision 17. After submitting DCD Revision 17 to the NRC, Westinghouse created a new COL Information Item (COL 3.9-7). This COL information item has been incorporated into Revision 18 of the DCD; however, the discussion of the COL information item below did not change.

In addition, in VCSNS COL FSAR Section 14.3, the applicant provided the following:

AP1000 COL Information Items

- STD COL 3.6-1

The applicant provided additional information in STD COL 3.6-1 to provide its plan for completing the pipe rupture hazard analysis. In its letter dated August 25, 2010, the applicant endorsed the March 18, 2010, and April 23, 2010, letters from the VEGP applicant that expanded the scope of this COL item.

- STD COL 3.9-7

In its letter dated August 25, 2010, the applicant endorsed the letter dated April 23, 2010, from the VEGP applicant that proposed to add a new COL Information Item 3.9-7. The applicant provided additional information in STD COL 3.9-7 to provide its plan for completing the piping design.

Supplemental Information

- STD SUP 14.3-1

The applicant provided supplemental information in STD SUP 14.3-1 in VCSNS COL FSAR Section 14.3.2.3, "Site-Specific ITAAC (SS-ITAAC)." This section describes the SS-ITAAC.

- VCS SUP 14.3-2

The applicant provided supplemental information in VCS SUP 14.3-2 in VCSNS COL FSAR Section 14.3.2.3.3, "Other Site–Specific Systems," discussing the ITAAC screening summary for site-specific systems.

14.3.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the CDM are given in Section 14.3 of NUREG-0800.

The applicable regulatory requirements for SS-ITAAC are in 10 CFR 52.80(a) and 10 CFR 52.97, "Issuance of combined licenses."

The regulatory basis for STD COL 3.6-1 and STD COL 3.9-7 are provided in NUREG-0800.

14.3.4 Technical Evaluation

The NRC staff reviewed Section 14.3 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the CDMs. The results of the NRC staff's evaluation of the information

incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 14.3.4 of the VEGP SER:

AP1000 COL Information Items

- *STD COL 3.6-1 and STD COL 3.9-7*

The portion of STD COL 3.6-1 addressed in VEGP COL FSAR Section 14.3 is the discussion of the ITAAC established to provide reasonable assurance that the design portion of the pipe rupture hazard analysis will be conducted in conformity with the license and the Commission's rules and regulations. The portion of STD COL 3.9-7 addressed in VEGP COL FSAR Section 14.3 is the discussion of the ITAAC established to provide reasonable assurance that the piping design is completed appropriately for applicable systems.

In a letter dated March 18, 2010, as revised by letter dated April 23, 2010, in response to an open item in the NRC staff's SER for BLN (Open Item 3.6-1 in BLN SER Section 3.6.4), the VEGP applicant provided proposed revisions to the VEGP COL application related to the pipe rupture hazard analysis ITAAC. In addition, the applicant provided information related to the piping design ITAAC.

The VEGP applicant proposed to expand FSAR Section 14.3.3 to include, as part of STD COL 3.6-1 and STD COL 3.9-7, a description of the ITAAC established to provide reasonable assurance that the design portion of the pipe rupture hazard

analysis and piping design will be conducted in conformity with the license and the Commission's rules and regulations. The applicant proposed revision of two license conditions in Part 10 of the COL application to address when the information would be available for staff review and expanding Appendix B of Part 10 to include the two ITAAC associated with review of the pipe rupture hazard analysis and the piping design. STD COL 3.6-1 and STD COL 3.9-7 are evaluated by the staff in Sections 3.6 and 3.12 respectively, of this SER, including the proposed pipe rupture hazard analysis ITAAC and piping design ITAAC.

Supplemental Information

- STD SUP 14.3-1, addressing SS-ITAAC
- VCS SUP 14.3-2, addressing ITAAC screening summary for additional site-specific systems

The following portion of this technical evaluation section is reproduced from Section 14.3.4 of the VEGP SER:

The following portion of this technical evaluation section is reproduced from Section 14.3 of the BLN SER. This portion of the BLN SER combined the evaluation of STD SUP 14.3-1 and BLN SUP 14.3-2. The NRC staff concludes that the evaluation of BLN SUP 14.3-2 applies to VEGP SUP 14.3-2, based on the similarities of these two plant-specific supplemental items.

The NRC staff concludes that the evaluation of BLN SUP 14.3-2 and VEGP SUP 14.3-2 applies to VCS SUP 14.3-2, based on the similarities of these three plant-specific supplemental items.

The following portion of this technical evaluation section is reproduced from Section 14.3.4 of the VEGP SER:

As part of STD SUP 14.3-1 and BLN SUP 14.3-2, the applicant provided:

- *Site-specific ITAAC selection criteria*
- *Site-specific ITAAC selection methodology*
- *Site-specific ITAAC screening summary*

A table of ITAAC entries was provided for each site-specific system described in the BLN COL FSAR that meets the selection criteria, and that is not included in the certified design. The COL applicant adopted the same selection criteria and methodology as the AP1000 DCD for establishing the SS-ITAAC. The selection criteria and methodology contained in the AP1000 DCD was accepted by the NRC as described in NUREG-1793. Therefore, the staff finds the applicant's use of this criteria and methodology appropriate and acceptable. The ITAAC are provided in tables with information for the following three columns: design commitment; inspection, tests, analyses; and acceptance criteria.

Emergency Planning-ITAAC (EP-ITAAC) are discussed in the application as required for inclusion in accordance with 10 CFR 52.80(a). The site-specific EP-ITAAC are based on the generic ITAAC provided in Appendix C.II.1-B of

RG 1.206. The staff's review of the current set of EP-ITAAC and the information related to this ITAAC is contained in Chapter 13.6 [13.3] of the SER.

Physical Security-ITAAC (PS-ITAAC) are discussed in the application as required for inclusion in accordance with 10 CFR 52.80(a). The site-specific PS-ITAAC are based on the generic ITAAC provided in Appendix C.II.1-C of RG 1.206. The NRC staff's review of the current set of PS-ITAAC and the information related to this ITAAC is contained in Chapter 13.4 [13.6] of the SER.

The NRC staff reviewed the supplemental information relating to ITAACs included under Section 14.3.2 of the BLN COL. The applicant identified no additional site-specific systems meeting the ITAAC selection criteria. With the exception of the Transmission Switchyard and Offsite Power System, the staff agrees no additional site-specific ITAAC are required in accordance with 10 CFR 52.80(a).

In RAI-14.3-1, the staff asked the applicant to justify the omission of site-specific ITAAC for transmission switchyard and the offsite power system. Subsequently, in a letter dated May 11, 2009, the applicant agreed to include an ITAAC in the BLN COL FSAR for transmission switchyard and the offsite power system. The information related to this ITAAC is evaluated in Chapter 8 of the SER. This is Confirmatory Item 14.3-1, pending NRC review and approval of the revised BLN COL FSAR.

Resolution of Standard Content Confirmatory Item 14.3-1

Confirmatory Item 14.3-1 required the applicant to update its FSAR to include proposed ITAAC for the offsite power system. The NRC staff provides its evaluation of the proposed ITAAC for the offsite power system in Section 8.2.A of this SER. The NRC staff verified that the VEGP COL application was appropriately updated. As a result, Confirmatory Item 14.3-1 is resolved.

14.3.5 Post Combined License Activities

The SS-ITAAC in the previous section of this SER are considered post-COL activities and discussed in the individual SER sections as stated above.

14.3.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the test program schedule, and there is no outstanding information to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VCSNS COL FSAR is acceptable because it meets the requirements of 10 CFR 52.80(a) and 10 CFR 52.97. The staff based its conclusions on the following:

- STD SUP 14.3-1 and VCS SUP 14.3-2 are acceptable because the ITAAC specified for the site-specific systems provide adequate assurance that these systems have been constructed and will be operated in conformity with the license and the Commission's rules and regulations.

15.0 ACCIDENT ANALYSIS

The evaluation of the safety of a nuclear power plant includes analyses of the plant's responses to postulated disturbances in process variables and postulated equipment failures or malfunctions. Such safety analyses provide a significant contribution to the selection of limiting conditions for operation, limiting safety system settings, and design specifications for components and systems from the standpoint of public health and safety. These analyses are a focal point of the combined license (COL) reviews. In Chapter 15 of the Final Safety Analysis Report (FSAR), the COL applicant discussed the applicable transient and accident analyses to justify its conformance to the applicable regulations.

The U.S. Nuclear Regulatory Commission (NRC) staff's review of V.C. Summer Nuclear Station (VCSNS) COL FSAR Chapter 15 follows the format in VCSNS Chapter 15.

15.0 Accident Analysis (Related to Regulatory Guide (RG) 1.206, Section C.III.1, Chapter 15, C.I.15.1, "Transient and Accident Classification," C.I.15.2, "Frequency of Occurrence," C.I.15.3, "Plant Characteristics Considered in the Safety Evaluation," C.I.15.4, "Assumed Protection System Actions," and C.I.15.5, "Evaluation of Individual Initiating Events")

15.0.1 Introduction

Design basis transient and accident analyses are required as a part of an evaluation of the safety of a nuclear power plant by analyzing the plant's responses to postulated disturbances in process variables and postulated equipment failures or malfunctions. The safety analyses provide a significant contribution to the determination of limiting conditions for operation, limiting safety system settings, and design specifications for plant components and systems to protect public health and safety.

15.0.2 Summary of Application

Section 15.0 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 15.0 of the AP1000 Design Control Document (DCD), Revision 19.

AP1000 COL Information Item

- STD COL 15.0-1

In letters dated August 25, 2010, and November 8, 2010, the applicant endorsed Vogtle Electric Generating Plant (VEGP) letters dated May 21, 2010, October 29, 2010, and February 8, 2011, respectively. In these letters, the applicant proposed Standard (STD) COL 15.0-1, adding new text to VCSNS COL FSAR Section 15.0. STD COL 15.0-1 was provided in a response to a request for additional information (RAI) related to the AP1000 design certification (DC) amendment review. Specifically, in its response dated May 6, 2009, to NRC RAI AP1000 DCD RAI-SRP15.0-SRSB-02, Westinghouse proposed COL Information Item 15.0-1 to provide documentation of the plant calorimetric uncertainty methodology. RAI-SRP15.0-SRSB-02 noted that the AP1000 DCD assumes a 2 percent power uncertainty for the initial condition for most transients and accidents. However, a 1 percent power uncertainty is assumed for the initial reactor power for the large-break loss-of-coolant accident (LOCA) in AP1000 DCD Section 15.6.5.4A, as well as the mass and energy release calculation in AP1000 DCD

Sections 6.2.1.3 and 6.2.1.4. In response to this RAI, Westinghouse proposed a new COL information item to be included in a future revision to AP1000 DCD Section 15.0.15. COL Information Item 15.0-1 states:

> Following selection of the actual plant operating instrumentation and calculation of the instrumentation uncertainties of the operating plant parameters prior to fuel load, the Combined License holder will calculate the primary power calorimetric uncertainty. The calculations will be completed using an NRC acceptable method and confirm that the safety analysis primary power calorimetric uncertainty bounds the calculated values.

License Conditions

- License Condition 2, Item 15.0-1

In a letter dated August 25, 2010, the applicant endorsed the VEGP letter dated May 21, 2010, that proposed adding Item 15.0-1 to License Condition 2, which would confirm that the plant-operating instrumentation installed for feedwater flow measurement is a Caldon/Cameron Leading Edge Flow Meter (LEFM) CheckPlus™ system. In its letter dated November 8, 2010, the applicant endorsed the VEGP letter dated October 29, 2010, letter that revised Item 15.0-1 to state that the documentation of plant calorimetric uncertainty methodology would be addressed as a plant-specific inspections, tests, analyses and acceptance criteria (ITAAC) item in lieu of License Condition 2.

- License Condition 6

In its letter dated November 8, 2010, the applicant endorsed the VEGP letter dated October 29, 2010, that proposed adding new line items to proposed License Condition 6, associated with the power calorimetric uncertainty instrumentation.

Inspections, Tests, Analyses and Acceptance Criteria

In its letter dated November 8, 2010, the applicant endorsed the VEGP letter dated October 29, 2010, that proposed ITAAC associated with the plant calorimetric uncertainty methodology.

15.0.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," and its supplements.

The need to address the calorimetric power uncertainty is found in Section 15.0 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)." Specifically, NUREG-0800 Section 15.0, Section I.3, "Plant Characteristics in the Safety Evaluation," states in part that "the reviewer also ensures that the application specifies the permitted fluctuations and uncertainties associated with reactor system parameters and assumes the appropriate conditions, within the operating band, as initial conditions for transient analysis." For the LOCA analysis, Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic licensing of production and utilization facilities," Appendix K, ECCS Evaluation Models," specifies that an assumed power level lower than

1.02 times the licensed power level may be used provided the proposed alternative value has been demonstrated to account for uncertainties due to power level instrumentation error.

15.0.4 Technical Evaluation

The NRC staff reviewed Section 15.0 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[21] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to accident analysis. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this safety evaluation report (SER) provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP, Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting.

The following portion of this technical evaluation section is reproduced from Section 15.0.4 of the VEGP SER:

> *AP1000 COL Information Item*
>
> - *STD COL 15.0-1*
>
> *In a letter dated May 21, 2010, as revised by a letter dated October 29, 2010, the VEGP applicant submitted information to address COL Information Item 15.0-1. In these letters, the applicant stated that the plant operating instrumentation for feedwater flow measurement would be the Caldon/Cameron LEFM CheckPlus™ system and referenced the NRC staff's final safety evaluation that approved the Caldon topical report, ER-157P, Revision 8, "Supplement to Topical Report ER-80P: Basis for a Power Uprate with the LEFM Check or Checkplus™*

[21] See Section 1.2.2 for a discussion of the staff's review related to verification of the scope of information to be included in a COL application that references a DC.

System." The NRC staff has previously approved several plant applications of the Caldon/Cameron CheckPlus™ LEFM system to support a power measurement uncertainty lower than 1 percent. This AP1000 COL information item supports the 1 percent power uncertainty. The NRC staff's review herein focused on ensuring that the generically approved Caldon/Cameron topical reports are properly implemented for the VEGP COL application. The NRC staff verified compliance with the applicable conditions in the NRC staff's safety evaluations approving the topical reports. The NRC staff's review also confirmed that appropriate license conditions and ITAAC were established for those items that cannot be resolved prior to issuance of the COL.

Compliance with Caldon/Cameron Topical Report ER-80P

NRC staff approval of the Caldon/Cameron topical report ER-80P (safety evaluation (SE) dated March 8, 1999) established four criteria to be satisfied by each applicant or licensee. The VEGP applicant addressed each criterion as described below.

> *Criterion 1*
>
> *Discuss maintenance and calibration procedures that will be implemented with the incorporation of the LEFM, including processes and contingencies for inoperable LEFM instrumentation and the effect on thermal power measurements and plant operation.*

The VEGP applicant stated that calibration and maintenance programs would be developed in accordance with the Caldon/Cameron LEFM technical manuals and recommendations. Preventative Maintenance (PM) tasks would be periodically performed within the plant control system and support systems to provide continued reliability. Plant instrumentations that affect the power calorimetric, including the Caldon/Cameron LEFM CheckPlus™ inputs, would be monitored by plant system engineering personnel. These instruments would be included in the plant PM program for periodic calibration. The NRC staff finds these measures acceptable.

The VEGP applicant stated when the Caldon/Cameron LEFM CheckPlus™ flow meter becomes inoperable beyond the allowed outage time; the plant would be operated at de-rated conditions. De-rated operation is appropriate at power levels consistent with a 2 percent power uncertainty. With the plant operating at 100 percent load with 1 percent uncertainty, a de-rating to 99 percent maintains a 2 percent uncertainty. When the LEFM CheckPlus™ is inoperable, plant calorimetric power would be monitored with the use of feedwater venturi elements. An inoperable LEFM would not leave the plant in a condition where steady-state operation would be immediately compromised since it would not directly impact the calibration of the nuclear instrumentation utilized for power level related trips or safety system actuations. Thus, procedures require confirmation of the availability of alternate instrumentation (i.e., the feedwater venturi instrumentation) and initiation of the above described reduction in power within 48 hours. These measures are consistent with the operating plants. The

NRC staff finds that operation with an inoperable Caldon/Cameron CheckPlus™ has been acceptably addressed.

Criterion 2

For plants that currently have LEFMs installed, provide an evaluation of the operational and maintenance history of the installed instrumentation and confirmation that the installed instrumentation is representative of the LEFM system and bounds the analyses and assumptions set forth in TR ER-80P.

The VEGP applicant stated that, since this application represents construction of a new plant with no previously installed LEFM equipment, this item is not applicable. The NRC staff finds the VEGP applicant's response acceptable.

Criterion 3

Confirm that the methodology used to calculate the uncertainty of the LEFM in comparison to the current feedwater instrumentation is based on accepted plant setpoint methodology (with regard to the development of instrument uncertainty). If an alternative approach is used, the application should be justified and applied to both venturi and ultrasonic flow measurement instrumentation installations for comparison.

The VEGP applicant stated that the uncertainty of the LEFM would be calculated in accordance with the Westinghouse methodology as applied in the Beaver Valley Power Station Units 1 and 2 License Amendment Request Nos. 289 and 161, which was approved by the NRC staff in a letter dated September 24, 2001, titled, "Beaver Valley Power Station, Unit Nos. 1 and 2 (BVPS-1 and 2) – Issuance of Amendment Re: 1.4-Percent Power Uprate and Revised BVPS-2 Heatup and Cooldown Curves." The NRC staff reviewed this SE and found that the calculation methodology complies with the recommendations of American National Standards Institute/Independent Safety Assessment (ANSI/ISA) Standard 67.04-2000, "Setpoints for Nuclear Safety-Related Instrumentation," and Regulatory Guide (RG) 1.105, "Setpoints for Safety-Related Instrumentation," Revision 2. In these calculations, uncertainties for the parameters that are not statistically independent are arithmetically summed to produce groups that are independent of each other, which can be statistically combined. Then, all independent parameters/groups that contribute to the power measurement uncertainty are combined using a square root of sum of squares (SRSS) approach to determine the overall power measurement uncertainty. This methodology has been reviewed and approved by the NRC staff for Westinghouse pressurized-water reactors (PWRs) (e.g., Beaver Valley), and is also acceptable for AP1000, which is a Westinghouse-designed PWR. The staff finds the AP1000 design sufficiently similar to other Westinghouse PWR designs that have been approved such that the methodology applies to both designs. Therefore, the NRC staff finds that the VEGP applicant's response acceptable.

Criterion 4

Licensees for plant installations where the ultrasonic meter (including LEFM) was not installed with flow elements calibrated to a site specific piping configuration (flow profiles and meter factors not representative of the plant specific installation), should provide additional justification for use. This justification should show that the meter installation is either independent of the plant specific flow profile for the stated accuracy, or that the installation can be shown to be equivalent to known calibrations and plant configurations for the specific installation including the propagation of flow profile effects at higher Reynolds numbers. Additionally, for previously installed calibrated elements, the licensee should confirm that the piping configuration remains bounding for the original LEFM installation and calibration assumptions.

The VEGP applicant stated that its application represents construction of a new plant with no previously installed flow metering equipment. The AP1000 main feedwater flow measurement instrumentation, consistent with the use of normalized flow meters, would be required to be calibrated at a certified test laboratory in hydraulic model geometry consistent with the AP1000 plant design. The LEFM commissioning process (i.e., installation acceptance testing) would confirm that the actual instrument performance is consistent with the assumptions of the uncertainty calculation. The NRC staff finds this response acceptable.

Compliance with Caldon/Cameron Topical Report ER-157P, Revision 8

The VEGP applicant addressed the five SE conditions found in the NRC SE for ER-157P, Revision 8, dated August 16, 2010, as described below.

Condition 1

Continued operation at the pre-failure power level for a pre-determined time and the decrease in power that must occur following that time are plant-specific and must be acceptably justified.

The VEGP applicant stated that a failure of the ultrasonic flow meter (UFM) will result in the use of the feedwater venturi as the input into the calorimetric calculation. Since the contingency is not based on continued reliance on the CheckPlus™ system, the NRC staff finds the VEGP applicant's response acceptable.

Condition 2

A CheckPlus operating with a single failure is not identical to an LEFM Check. Although the effect on hydraulic behavior is expected to be negligible, this must be acceptably quantified if a licensee wishes to operate using the degraded CheckPlus at an increased uncertainty.

The VEGP applicant stated that a degraded UFM resulting in an instrument uncertainty greater than the values assumed in the AP1000 calorimetric uncertainty calculation would be considered a failure and subject to compensatory actions as discussed above in response to Caldon/Cameron topical report (ER-80P) Criterion 1. Since the applicant does not intend to operate using a degraded CheckPlus™, the NRC staff finds the VEGP applicant's response acceptable.

Condition 3

An applicant with a comparable geometry can reference the above Section 3.2.1 [of the SE for ER-157P] finding to support a conclusion that downstream geometry does not have a significant influence on CheckPlus calibration. However, CheckPlus test results do not apply to a Check and downstream effects with use of a CheckPlus with disabled components that make the CheckPlus comparable to a Check must be addressed. An acceptable method is to conduct applicable Alden Laboratory tests.

The VEGP applicant stated that the AP1000 feedwater flow measurement instrumentation would be located in piping with downstream geometry more favorable than the arrangements referenced in Section 3.2.1 of the SE for ER-157P. Therefore, the effects of downstream piping geometry are not considered to have a significant influence on the accuracy of the UFM. Because the flow measurement instrumentation would be located in piping with favorable downstream geometry, the NRC staff finds the VEGP applicant's response acceptable.

Condition 4

An applicant that requests a MUR [measurement uncertainty recapture] with the upstream flow straightener configuration discussed in Section 3.2.2 [of the SE for ER-157P] should provide justification for claimed CheckPlus uncertainty that extends the justification provided in Reference 17 [Letter from E. Hauser dated March 19, 2010]. Since the Reference 17 evaluation does not apply to the Check, a comparable evaluation must be accomplished if a Check is to be installed downstream of a tubular flow straightener.

The VEGP applicant stated that the AP1000 UFM installation would not utilize an upstream flow straightener. Therefore, this condition is not applicable to the AP1000 design. The NRC staff finds the VEGP applicant's response acceptable.

Condition 5

An applicant assuming large uncertainties in steam moisture content should have an engineering basis for the distribution of the uncertainties or, alternatively, should ensure that their

calculations provide margin sufficient to cover the differences shown in Figure 1 of Reference 18 [Letter from E. Hauser dated March 18, 2010].

The VEGP applicant stated that this AP1000 application of the CheckPlus™ LEFM is to support a 1 percent overall power uncertainty, as compared to lower than 0.5 percent typically justified for operating plants using CheckPlus™. The result of this application of the LEFM at a higher uncertainty (i.e., lower accuracy) is that the assumed steam separator/dryer performance becomes less of a relative contribution to the overall uncertainty. Furthermore, an engineering basis for the AP1000 moisture content assumption is in the calorimetric uncertainty calculation. Because the steam separator/dryer performance uncertainty is a relatively small contribution to the overall uncertainty of 1 percent, the NRC staff finds the VEGP applicant's response acceptable.

Based on its review of the VEGP applicant's responses, the NRC staff finds that the licensee has acceptably addressed all applicable conditions specified in the NRC staff's SEs for the Caldon/Cameron topical reports. Hence, the NRC staff finds that the Caldon/Cameron topical reports, ER-80P and ER-157P, are acceptable for referencing in the VEGP COL application and that the applicant has adequately addressed COL Information Item 15.0-1.

<u>License Conditions</u>

- *License Condition 2, Item 15.0-1*

In a letter dated May 21, 2010, the applicant proposed adding Item 15.0-1 to License Condition 2 that would confirm that the plant operating instrumentation installed for feedwater flow measurement is a Caldon/Cameron LEFM CheckPlus™ system. In its October 29, 2010, letter, the applicant revised Item 15.0-1 to state that the documentation of plant calorimetric uncertainty methodology would be addressed as a plant-specific ITAAC item in lieu of License Condition 2. The staff finds the use of ITAAC to confirm proper documentation of plant calorimetric uncertainty methodology to be acceptable. The plant-specific ITAAC item proposed by the applicant is evaluated below.

- *License Condition 6*

In a letter dated October 29, 2010, the applicant proposed adding new line items to proposed License Condition 6, associated with the power calorimetric uncertainty instrumentation. Specifically, the applicant proposed to add the following two items:

- *The availability of documented instrumentation uncertainties to calculate a power calorimetric uncertainty (prior to initial fuel load).*

- *The availability of administrative controls to implement maintenance and contingency activities related to the power calorimetric uncertainty instrumentation (prior to initial fuel load).*

The two items under License Condition 6 are needed because documentation for the actual instrument uncertainties would only be available after the equipment is procured and tested and administrative controls would not be available until after the equipment is procured, which would be after the COL license is issued. The staff finds the first item acceptable because, when combined with the methodology in the proposed ITAAC, it would allow the staff to confirm that the procured equipment results in a power uncertainty of no more than 1 percent prior to the start of plant operation. The staff finds the second item acceptable because it would allow the staff to confirm that the administrative controls are in place to meet ER-80P Criterion 1 prior to the start of plant operation. These items correspond to License Condition 15-1 in the following section.

Inspections, Tests, Analyses and Acceptance Criteria

In a letter dated October 29, 2010, the applicant proposed ITAAC associated with the plant calorimetric uncertainty methodology. The proposed ITAAC item is repeated in Table 15.0-1 of this SER. This ITAAC would confirm that: (1) the installed feedwater flow measurement device is the Caldon CheckPlus™ LEFM; (2) the power calorimetric uncertainty calculation for that instrumentation is based on an acceptable Westinghouse methodology as described above in Criterion 3 for ER-80P and the uncertainty values in the calculation for that instrumentation are not lower than those for the actual installed instrumentation; and (3) the calculated calorimetric power uncertainty measurement values are bounded by the 1 percent uncertainty value assumed for the initial reactor power in the safety analysis. The proposed ITAAC would allow the NRC staff to confirm, prior to initial fuel load, that the necessary conditions for STD COL 15.0-1 (COL Information Item 15.0-1) have been satisfied. Therefore, the NRC staff found the proposed ITAAC acceptable.

The incorporation of the planned changes to the VEGP COL FSAR detailed in the applicant's letters dated May 21, 2010, and October 29, 2010, will be tracked as ***Confirmatory Item 15.0-1****.*

Resolution of Standard Content Confirmatory Item 15.0-1

Confirmatory Item 15.0-1 is an applicant commitment to revise its FSAR Section 15.0 to address COL Information Item STD COL 15.0-1. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 15.0-1 is now closed.

Evaluation of Additional Information Submitted by Applicant

In a letter dated February 6, 2011, submitted in response to a January 24, 2011, letter from the ACRS, the applicant provided additional information related to the flow meter instrumentation, including proposed changes to the FSAR. The applicant stated that, prior to installation, the LEFM CheckPlus™ system will be calibrated at a certified facility with a test model representative of plant piping configurations. After installation in the plant, the LEFM CheckPlus™ system will be tested in accordance with the LEFM CheckPlus™ system commissioning procedure developed by Cameron to confirm that the actual instrument performance is consistent with the assumption of the uncertainty calculation.

The staff found these changes acceptable because they clarified the applicant commitment regarding calibration and testing of the instrument. The staff verified that the VEGP COL FSAR was revised to include the proposed changes.

15.0.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff proposes to include the following ITAAC:

- The licensee shall perform and satisfy the plant calorimetric uncertainty and plant instrumentation performance analysis ITAAC defined in SER Table 15.0-1, "Power Calorimetric Uncertainty Methodology."

For the reasons discussed in the technical evaluation section above, the staff proposes to include the following license condition:

- License Condition (15-1) - No later than 12 months after issuance of the COL, the licensee shall submit to the Director of Office of New Reactors a schedule that supports planning for and conduct of NRC inspections of license calculations for power calorimetric uncertainty and administrative controls to implement maintenance and contingency activities related to the power calorimetric uncertainty instrumentation. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the license condition has been fully implemented. This schedule shall address:

    - The availability of documented instrumentation uncertainties to calculate a power calorimetric uncertainty (prior to initial fuel load).

    - The availability of administrative controls to implement maintenance and contingency activities related to the power calorimetric uncertainty instrumentation (prior to initial fuel load).

15.0.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to accident analysis and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL application is acceptable and meets the NRC regulations. The staff based its conclusion on the following:

- STD COL 15.0-1 is acceptable because the applicant has demonstrated that the conditions identified by the NRC in its generic evaluation have been satisfied for the use of the Caldon/Cameron LEFM CheckPlus™ system for VCSNS Units 2 and 3. In addition, ITAAC and a license condition have been put in place to allow the staff to verify the plant calorimetric uncertainty methodology prior to initial fuel load.

15.1 Increase in Heat Removal from the Primary System (Related to RG 1.206, Section C.III.1, Chapter 15, C.I.15.6, "Event Evaluation")

Analyses focused on the increase in heat removal from the primary system address anticipated operational occurrences (AOOs) and accidents that increase the heat removal by the secondary system, which could result in a decrease in reactor coolant temperature. Increased heat removal can be caused by:

- Feedwater system malfunctions causing a reduction in feedwater temperature
- Feedwater system malfunctions causing an increase in feedwater flow
- Excessive increase in secondary steam flow
- Inadvertent opening of a steam generator relief or safety valve
- Steam system piping failure
- Inadvertent operation of the passive residual heat removal heat exchanger

Section 15.1 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 15.1, "Increase in Heat Removal from the Primary System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

15.2 Decrease in Heat Removal By the Secondary System

Analyses focused on the decrease in heat removal by the secondary system address AOOs and accidents that could result in a reduction of the capacity of the secondary system to remove heat generated in the reactor coolant system (RCS). Decreased heat removal can be caused by:

- Steam pressure regulator malfunction or failure that results in decreasing steam flow
- Loss of external electrical load
- Turbine trip
- Inadvertent closure of main steam isolation valves
- Loss of condenser vacuum and other events resulting in turbine trip
- Loss of alternating current (ac) power to station auxiliaries
- Loss of normal feedwater flow
- Feedwater system pipe break

Section 15.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 15.2, "Decrease in Heat Removal by the Secondary System," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

15.3 Decrease in Reactor Coolant System Flow Rate

Analyses focused on the decrease in RCS flow rate address AOOs and accidents that could result in a decrease in the RCS flow rate. Decreased flow rate can be caused by:

- Partial loss of forced reactor coolant flow
- Complete loss of forced reactor coolant flow
- Reactor coolant pump (RCP) shaft seizure (locked motor)
- RCP shaft break

Section 15.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 15.3, "Decrease in Reactor Coolant System Flow Rate," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

15.4 Reactivity and Power Distribution Anomalies

15.4.1 Introduction

Analyses focused on reactivity and power distribution anomalies address AOOs and accidents that could result in anomalies in the reactivity or power distribution in the reactor core. Reactivity and power distribution anomalies can be caused by:

- Uncontrolled rod cluster control assembly (RCCA) bank withdrawal from a subcritical or low-power startup condition
- Uncontrolled RCCA bank withdrawal at power
- RCCA misalignment
- Startup of an inactive RCP at an incorrect temperature
- Chemical and volume control system malfunction that results in a decrease in the boron concentration in the reactor coolant
- Inadvertent loading and operation of a fuel assembly in an improper position
- Spectrum of RCCA ejection accidents

15.4.2 Summary of Application

Section 15.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 15.4 of the AP1000 DCD, Revision 19.

In addition, in Section 1.9 of the VCSNS COL FSAR, the applicant provided the following:

Generic Letter 85-05

In its letter dated August 23, 2010, the applicant endorsed a letter dated January 22, 2010, from the VEGP applicant that proposed to include Generic Letter (GL) 85-05, "Inadvertent Boron Dilution Events," in Table 1.9-204 of the FSAR as part of STD COL 1.9-2 to address Bulletins and GLs.

15.4.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

15.4.4 Technical Evaluation

The NRC staff reviewed Section 15.4 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to reactivity and power distribution anomalies. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP, Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 15.4.4 of the VEGP SER:

> *Generic Letter 85-05*
>
> *GL 85-05, "Inadvertent Boron Dilution Events," informed each PWR licensee of the NRC staff position resulting from the evaluation of Generic Issue 22, "Inadvertent Boron Dilution Events," and urges each licensee to ensure that its plants have adequate protection against boron dilution events. GL 85-05 was evaluated as a part of the AP1000 DCD review, and the evaluation was documented in NUREG-1793, Chapter 20. GL 85-05 was resolved based on the analyses of inadvertent boron dilution events described in AP1000 DCD Section 15.4.6, which show that in all modes of operation the inadvertent boron dilution is prevented or responded to by automatic functions, or sufficient time is available for operator action to terminate the transient. The staff also stated that COL applicants should develop plant-specific emergency operating procedures (EOPs) that address the boron dilution events. The development of EOPs is identified as COL Information Item 13.5-1, Plant Procedures, which is addressed in BLN FSAR Section 13.5. Therefore, based on the above, the applicant needs to reinsert a reference to GL 85-05 in FSAR Table 1.9-204 and provide a cross reference to COL Information Item 13.5-1. This is* ***Open Item 15.4-1.***
>
> *Resolution of Standard Content Open Item 15.4-1*
>
> *To address Open Item 15.4-1 in the BLN SER with open items, the VEGP applicant stated in its letter dated January 22, 2010, that VEGP COL FSAR Table 1.9-204, "Generic Communications Assessment," would be revised to list GL 85-05 with a cross-reference to VEGP COL FSAR Section 13.5. Until this change is incorporated in a future version of the VEGP COL FSAR, this item is being tracked as* ***Confirmatory Item 15.4-1.***
>
> *Resolution of Standard Content Confirmatory Item 15.4-1*
>
> *Confirmatory Item 15.4-1 is an applicant commitment to revise its FSAR Table 1.9-204 to list GL 85-05 with a cross-reference to VEGP COL FSAR Section 13.5. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 15.4-1 is now closed.*

15.4.5 Post Combined License Activities

There are no post-COL activities related to this section.

15.4.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to reactivity and power distribution anomalies, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR related to GL 85-05 is acceptable. Plant-specific EOPs, which will include responding to abnormal events such as the boron dilution events discussed in GL 85-05, are evaluated by the staff in Section 13.5 of this SER.

15.5 Increase in Reactor Coolant Inventory

Analyses focused on the increase in reactor coolant inventory address AOOs that could result in an increase in RCS inventory. Increased inventory can be caused by:

- Inadvertent operation of the core makeup tanks during power operation
- Chemical and volume control system malfunctions that increases reactor coolant inventory

Section 15.5 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 15.5, "Increase in Reactor Coolant Inventory," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

15.6 Decrease in Reactor Coolant Inventory

Analyses focused on the decrease in reactor coolant inventory address AOOs and accidents that could result in a decrease in RCS inventory. Decreased inventory can be caused by the following:

- Inadvertent opening of a pressurizer safety valve or inadvertent operation of the automatic depressurization system
- Failure of small lines carrying primary coolant outside containment
- Steam generator tube failure
- LOCA resulting from a spectrum of postulated piping breaks within the reactor coolant pressure boundary (RCPB)

Section 15.6 of the VCSNS COL FSAR has one item, VCS COL 2.3-4, related to site-specific χ/Q values. The effect of VCS COL 2.3-4 on the design-basis accident (DBA) radiological consequences analyses is addressed in Section 15A of this SER.

With the exception of the item noted above, Section 15.6 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 15.6, "Decrease in Reactor Coolant Inventory," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

15.7 Radioactive Release From a Subsystem or Component

15.7.1 Introduction

The group of events considered includes the following:

- Gas waste management system leak or failure
- Liquid waste management system leak or failure (atmospheric release)
- Release of radioactivity to the environment via liquid pathways
- Fuel handling accident
- Spent fuel cask drop accident

15.7.2 Summary of Application

Section 15.7 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 15.7 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 15.7, the applicant provided the following:

AP1000 COL Information Item

- VCS COL 15.7-1

The applicant provided additional information in VCS COL 15.7-1 to address COL Information Item 15.7-1, "Consequences of Tank Failures." This COL item is addressed by the applicant in VCSNS COL FSAR Section 2.4.13.

15.7.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the radioactive release from a subsystem or component are given in Section 11.2 of NUREG-0800, including Branch Technical Position (BTP) 11-6, and Section 2.4.13 of NUREG-0800, Acceptance Criterion Number 5.

The regulatory basis for acceptance of the supplementary information on consequences of a tank failure is established in:

- 10 CFR Part 20, "Standards for protection against radiation," Appendix B, "Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage"

- 10 CFR 20.1301, "Dose limits for individual members of the public"

- 10 CFR 20.1406, "Minimization of contamination"

- 10 CFR Part 50, “Domestic licensing of production and utilization facilities,” Appendix A, “General Design Criteria for Nuclear Power Plants,” General Design Criteria (GDC) 60, “Control of Releases of Radioactive Materials to the Environment,” and GDC 61, “Fuel Storage and Handling and Radioactivity Control”

- 10 CFR 50.34a, “Design objectives for equipment to control releases of radioactive material in effluents—nuclear power reactors”

- 10 CFR 50.36a, “Technical specifications on effluents from nuclear power reactors”

- 10 CFR 52.80(a), “Contents of applications; additional technical information”

- Regulatory Guide (RG) 4.21, “Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning”

- RG 1.109, “Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I,” Revision 1

- RG 1.113, “Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I,” Revision 1

- RG 1.143, “Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants,” Revision 2, Regulatory Position C.1.1

15.7.4 Technical Evaluation

The NRC staff reviewed Section 15.7 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff’s review confirmed that the information in the application and incorporated by reference addresses the required information relating to the radioactive release from a subsystem or component. The results of the NRC staff’s evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

AP1000 COL Information Item

- VCS COL 15.7-1

COL Information Item 15.7-1 states:

> Combined License applicant referencing the AP1000 certified design will perform an analysis of the consequences of potential release of radioactivity to the environment due to a liquid tank failure as outlined in Subsection 15.7.3.

The applicant addresses the consequence of a liquid waste tank failure in VCSNS COL FSAR Section 2.4.13. The staff's evaluation of liquid waste tank failure is described in Section 11.2, "Liquid Waste Management Systems," of this SER.

15.7.5 Post Combined License Activities

There are no post-COL activities related to this section.

15.7.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to radioactive release from a subsystem or component, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the regulatory guidance in Sections 2.4.13 and 11.2 of NUREG-0800. The staff based its conclusion on the following:

- VCS COL 15.7-1 is acceptable based on the evaluations in Sections 2.4.13 and 11.2 of this SER.

15.8 Anticipated Transients Without Scram

Analyses focused on anticipated transients without scram (ATWS) address an AOO during which an automatic reactor scram is required but fails to occur due to a common mode fault in the reactor protection system.

Section 15.8 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 15.8, "Anticipated Transients Without Scram," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Appendix 15A Evaluation Models and Parameters for Analysis of Radiological Consequences of Accidents

15A.1 Introduction

This appendix includes the parameters and models that form the basis of the radiological consequences analyses for the various postulated accidents.

15A.2 Summary of Application

In the VCSNS COL FSAR, Revision 5, Chapter 15, "Accident Analyses," the applicant incorporated by reference Appendix 15A to Chapter 15, "Accident Analysis," of the AP1000 DCD, Revision 19.

In addition, the applicant provided the following:

AP1000 COL Information Item

- VCS COL 2.3-4

In VCSNS COL FSAR Sections 15.6 and 15A, the applicant provided additional information in VCS COL 2.3-4 on site-specific χ/Q values to partially resolve COL Information Item 2.3-4. The applicant provided additional information in VCSNS COL FSAR Section 2.3.4 to resolve the remaining portion of COL Information Item 2.3-4, and the staff's review of this portion is in Section 2.3.4 of this SER.

15A.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the accident analyses are given in Section 15.0.3 of NUREG-0800.

Requirements for the technical information in the FSAR for the application for a COL are given in 10 CFR 52.79. In particular, 10 CFR 52.79(a)(1)(vi) requires a description and safety assessment of the site on which the facility is to be located, including an evaluation of the offsite radiological consequences of postulated accidents to show that the site characteristics comply with the following offsite radiological consequence evaluation factors:

(A) An individual located at any point on the exclusion area boundary (EAB) for any 2-hour period following the onset of the postulated fission product release, would not receive a radiation dose in excess of 0.25 Sievert (Sv) (25 roentgen equivalent man (rem)) total effective dose equivalent (TEDE).

(B) An individual located at any point on the outer boundary of the low population zone (LPZ), who is exposed to the radioactive cloud resulting from the postulated fission product release (during the entire period of its passage) would not receive a radiation dose in excess of 0.25 Sv (25 rem) TEDE.

Applications for DCs must include similar evaluations to show compliance with 10 CFR 52.47(a)(2), which includes the same offsite radiological consequence evaluation factors as given in 10 CFR 52.79(a)(1). In other words, both the AP1000 DCD and the COL FSAR must have DBA radiological consequences analyses that estimate a dose at or below 0.25 Sv (25 rem) TEDE at the EAB and LPZ receptors.

Compliance with the control room habitability dose requirements of 10 CFR Part 50, Appendix A, GDC 19, "Control Room," requires that the applicant show that, for a plant located at the VCSNS site, the control room provides adequate radiation protection to ensure that radiation exposures shall not exceed 0.05 Sv (5 rem) TEDE to permit access and occupancy of the control room under accident conditions for the duration of the accident.

15A.4 Technical Evaluation

The NRC staff reviewed Appendix 15A to Chapter 15 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to radiological consequences of accidents. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

AP1000 COL Information Item

- VCS COL 2.3-4

In VCSNS COL FSAR Sections 15.6 and 15A, the applicant stated that it provided additional information in VCS COL 2.3-4 to partially resolve COL Information Item 2.3-4, which states:

> Combined License applicants referencing the AP1000 certified design will address the site-specific χ/Q values specified in [DCD] Subsection 2.3.4. For a site selected that exceeds the bounding χ/Q values, the Combined License applicant will address how the radiological consequences associated with the controlling design basis accident continue to meet the dose reference values given in 10 CFR Part 50.34 and control room operator dose limits given in General Design Criteria 19 using site-specific χ/Q values. The Combined License applicant should consider topographical characteristics in the vicinity of the site for restrictions of horizontal and/or vertical plume spread, channeling or other changes in airflow trajectories, and other unusual conditions affecting atmospheric transport and diffusion between the source and receptors. No further action is required for sites within the bounds of the site parameters for atmospheric dispersion.
>
> With regard to assessment of the postulated impact of an accident on the environment, the COL applicant will provide χ/Q values for each cumulative frequency distribution which exceeds the median value (50 percent of the time).

The commitment was also captured as COL Action Items 2.3.4-1, 2.3.4-2, and 2.3.4-3 in Appendix F of NUREG-1793, which states:

> The COL applicant will determine the site specific χ/Q values. If the site-specific values exceed the bounding χ/Q values, the COL applicant will address how the radiological consequences associated with the controlling DBA continue to meet the radiological dose consequence criteria given in Title 10, Section 50.34(a)(1)(ii)(D)*(1) and (2)*, of the *Code of Federal Regulations* (10 CFR 50.34), using site-specific χ/Q values.
>
> The COL applicant will determine the site specific χ/Q values. If the site-specific values exceed the bounding χ/Q values, the COL applicant will address how the radiological consequences associated with the controlling DBA continue to meet the control room operator dose limits given in General Design Criteria 19, using site -specific χ/Q values.
>
> The COL applicant will provide χ/Q values for each cumulative frequency distribution that exceeds the median value (50 percent of the time).

VCS COL 2.3-4 added text to the end of Section 15.6.5.3.7.3 and Section 15A.3.3 of the AP1000 DCD to state that the site-specific atmospheric dispersion (χ/Q) values provided in VCSNS COL FSAR Section 2.3 are bounded by the values given in AP1000 DCD Table 15A-5, "Offsite Atmospheric Dispersion factors (χ/Q) For Accident Dose Analysis," (offsite receptors) and Table 15A-6, "Control Room Atmospheric Dispersion Factors (χ/Q) For Accident Dose Analysis" (control room receptors).

The NRC staff reviewed the impact of the site-specific χ/Q values given in response to VCS COL 2.3-4 on the radiological consequences of DBAs. The applicant did not provide site-specific doses at the EAB, LPZ, or control room for the DBAs referenced in AP1000 DCD, Chapter 15, but instead incorporated by reference the analysis of the radiological consequences in AP1000 DCD, Chapter 15.

AP1000 DCD, Chapter 15, over several sections, describes and provides results of the radiological consequences analyses for the DBAs applicable to the AP1000 design. A list of the DBAs analyzed for radiological consequences and the corresponding sections where the radiological consequences analyses for those DBAs are discussed in the AP1000 DCD is given below.

DCD Section	Design Basis Accident
15.1.5.4	Main Steam Line Break
15.3.3.3	Reactor Coolant Pump Shaft Seizure (Locked Rotor)
15.4.8.3	Control Rod Ejection
15.6.2	Small Line Break
15.6.3.3	Steam Generator Tube Rupture
15.6.5.3	Loss of Coolant Accident (LOCA)
15.7.4.3	Fuel Handling Accident

The DBA radiological consequences analyses in the AP1000 DCD used design reference values for the accident atmospheric dispersion factors in place of site-specific values. The χ/Q values are the only input to the DBA radiological consequences analyses that are affected by the site characteristics. To resolve VCS COL 2.3-4, the applicant discussed the VCSNS site-specific short-term (accident) χ/Q values in VCSNS COL FSAR Section 2.3.4. The VCSNS site-specific EAB and LPZ χ/Q values for DBAs are given in VCSNS COL FSAR Table 2.0-201, and the control room χ/Q values for DBAs are given in VCSNS COL FSAR Table 2.0-202. In Section 2.3.4 of this SER, the NRC staff discusses its review of the VCSNS site-specific χ/Q values and resolution to VCS COL 2.3-4.

The estimated DBA dose calculated for a particular site is affected by the site characteristics through the calculated χ/Q input to the analysis; therefore, the resulting dose would be different than that calculated generically for the AP1000 design in the DCD. All other inputs and assumptions in the radiological consequences analyses remain the same as in the DCD. Smaller χ/Q values are associated with greater dilution capability, resulting in lower radiological doses. When comparing a DCD site parameter χ/Q value and a site characteristic χ/Q value, the site is acceptable for the design if the site characteristic χ/Q value is smaller than the site parameter χ/Q value. Such a comparison shows that the site has better dispersion characteristics than that required by the reactor design.

For each of the DBAs, the VCSNS site-specific χ/Q values for each time averaging period are less than the comparable design reference χ/Q values used by Westinghouse in the AP1000 DCD radiological consequences analyses. Since the result of the radiological consequences analysis for a DBA during any time period of radioactive material release from the plant is directly proportional to the χ/Q for that time period, and because the VCSNS site-specific χ/Q values are less than the comparable AP1000 DCD design reference χ/Q values for all time periods and all accidents, then the VCSNS site-specific estimated total dose for each DBA is, therefore, less than the AP1000 DCD estimated total dose for each DBA.

Since the AP1000 DCD Chapter 15 DBA radiological consequences analyses show that the offsite radiological consequences meet the regulatory dose requirements of 10 CFR 52.47(a)(2) and the control room consequences meet the regulatory dose requirements of GDC 19, and since, by the logic above, the VCSNS site-specific DBA radiological consequences are estimated to be less than those calculated in AP1000 DCD, then the applicant has sufficiently shown that the DBA offsite radiological consequences meet the requirements of 10 CFR 52.79(a)(1) and the DBA control room radiological consequences meet the requirements of GDC 19.

The effect of the site-specific χ/Q values on the Technical Support Center radiological habitability is evaluated by the NRC staff in SER Section 13.3 as part of its evaluation of VCS DEP 18.8-1.

15A.5 Post Combined License Activities

There are no post-COL activities related to this section.

15A.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the evaluation models and parameters for analysis of radiological consequences of accidents, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the requirements of 10 CFR 52.79(a)(1) and 10 CFR Part 50, Appendix A, GDC 19. The staff based its conclusion on the following:

- VCS COL 2.3-4 is acceptable because the DBA offsite radiological consequences meet the requirements of 10 CFR 52.79(a)(1) and the DBA control room radiological consequences meet the requirements of GDC 19.

Appendix 15B Removal of Airborne Activity from the Containment Atmosphere Following a LOCA

This appendix includes information related to the AP1000 design, which does not depend on active systems to remove airborne particulates or elemental iodine from the containment atmosphere following a postulated LOCA with core melt. The AP1000 applicant stated that naturally occurring passive removal processes provide significant removal capability such that airborne elemental iodine is reduced to very low levels within a few hours and the airborne particulates are reduced to extremely low levels within 12 hours.

Appendix 15B of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Appendix 15B, "Removal of Airborne Activity from the Containment Atmosphere Following a LOCA," of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Table 15.0-1. Power Calorimetric Uncertainty Methodology

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4. The plant calorimetric uncertainty and plant instrumentation performance is bounded by the 1 percent calorimetric uncertainty value assumed for the initial reactor power in the safety analysis.	Inspection will be performed of the plant operating instrumentation installed for feedwater flow measurement, its associated power calorimetric uncertainty calculation, and the calculated calorimetric values.	a) the as-built system takes input for feedwater flow measurement from a Caldon [Cameron] LEFM CheckPlus™ System; b) the power calorimetric uncertainty calculation documented for that instrumentation is based on an NRC-accepted Westinghouse methodology and the uncertainty values for that instrumentation are not lower than those for the actual installed instrumentation; and c) the calculated calorimetric power uncertainty measure values are bounded by the 1 percent uncertainty value assumed for the initial reactor power in the safety analysis.

16.0 TECHNICAL SPECIFICATIONS

This chapter discusses the plant-specific technical specifications (PTS), as well as the design reliability assurance program (D-RAP) and the controls for systems, structures, and components (SSCs) required for defense in depth in accordance with the program for regulatory treatment of nonsafety systems (RTNSS).

16.1 Technical Specifications

16.1.1 Introduction

Section 16.1, "Technical Specifications," of the V.C. Summer Nuclear Station (VCSNS) combined license (COL) Final Safety Analysis Report (FSAR), and the VCSNS COL Part 4, "Technical Specifications," provide the PTS for VCSNS Units 2 and 3, in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.36, "Technical specifications," and 10 CFR 52.79(a)(30). Technical Specifications (TS) impose limits, operating conditions, and other requirements upon reactor facility operation for the public health and safety. The TS are derived from the analyses and evaluations in the safety analysis report. In general, TS must include: (1) safety limits and limiting safety system settings; (2) limiting conditions for operation (LCO); (3) surveillance requirements (SRs); (4) design features; and (5) administrative controls. The PTS are derived from the analyses and evaluations in the AP1000 Design Control Document (DCD) and the VCSNS COL FSAR, Revision 5.

As part of the regulatory standardization effort, the U.S. Nuclear Regulatory Commission (NRC) staff has prepared standard technical specifications (STS) for each of the light-water reactor nuclear steam supply systems and associated balance-of-plant equipment systems. In 1992, the NRC issued the STS to clarify the content and format of requirements necessary to ensure safe operation of nuclear power plants. The STS for Westinghouse pressurized water reactors are included in NUREG-1431, "Standard Technical Specifications - Westinghouse Plants." Volume 1 addresses the STS, and Volume 2 addresses the associated STS Bases. The STS include bases for safety limits, limiting safety system settings, LCO, and associated action and surveillance requirements. Major revisions to the STS were published in 1995 (Revision 1), 2001 (Revision 2), and 2004 (Revision 3).

The format and content of the PTS and Bases for a COL referencing a certified design should be based on the generic TS (GTS) and Bases for that design. For a COL application that references a certified design, the proposed PTS and Bases may include appropriate plant-specific deviations from the referenced GTS and Bases when warranted. These deviations, if included with the COL application, need to be justified.

16.1.2 Summary of Application

Section 16.1 of the VCSNS COL FSAR, Revision 5, incorporates by reference Sections 16.1.1 and 16.1.2 of the AP1000 DCD, Revision 19. Part 4 of the VCSNS COL incorporates by reference the AP1000 GTS and Bases in Section 16.1 of the DCD. In accordance with Section IV(A)(2)(c) of Appendix D, "Design Certification Rule for the AP1000 Design" to 10 CFR Part 52, "Licenses, certifications, and approvals for nuclear power plants," the applicant's PTS consist of the AP1000 GTS and site-specific information. No departures from the AP1000 GTS were proposed by the applicant.

The AP1000 GTS include items that a COL applicant must satisfy in order to complete a particular GTS provision. Detailed design information, equipment selection, instrumentation settings, and other information not available at the time of design certification (DC), are needed to establish the values or information to be included in the PTS. Locations for the addition of this information are signified in the GTS by square brackets [ ] or reviewer's notes to indicate that the COL applicant must provide plant-specific values or alternate text.

In VCSNS COL Part 4, the applicant provided the following:

AP1000 COL Information Item

- VCS COL 16.1-1

The applicant provided additional information in VCS COL 16.1-1 to resolve COL Information Item 16.1-1 (COL Action Item 16.2-1). The applicant provided additional information to address each of the remaining brackets [ ] and reviewer's notes in the AP1000 GTS.

The following sections of the VCSNS PTS and Bases include information that the applicant addressed as part of COL Information Item 16.1-1:

- PTS 3.3.1, 3.3.2, and 3.6.4
- PTS 4.1, 4.1.1, and 4.1.2
- PTS 5.1.1, 5.1.2, 5.2.1.a, 5.2.1.b, 5.2.2, 5.3, 5.3.1, 5.6.1, and 5.6.2

16.1.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for TS and Bases reviews are given in Section 16 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)." Areas of review that interface with other sections of the standard review plan (SRP) can also be found in Section 16 of NUREG-0800.

The applicable regulatory requirements for the information being reviewed in this section are:

- 10 CFR 50.36
- 10 CFR 52.79(a)(30)

16.1.4 Technical Evaluation

The NRC staff reviewed Section 16.1 of the VCSNS COL FSAR and Part 4 of the VCSNS COL application, and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic[22].

[22] See Section 1.2.2 for a discussion of the staff's review related to verification of the scope of information to be included in a COL application that references a DC.

The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the TS. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this safety evaluation report (SER) provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (Vogtle Electric Generating Plant [VEGP], Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs).

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application.

Many VEGP SER section numbers were changed from those used in the BLN SER to more closely follow the PTS numbering. Therefore, the corresponding BLN SER section numbers are frequently identified when quoting standard content material from the SER for the reference COL application (VEGP).

The staff reviewed the information in the VCSNS COL FSAR and the VCSNS COL application, Part 4:

AP1000 COL Information Item

- VCS COL 16.1-1

The following portion of this technical evaluation section is reproduced from Section 16.1.4 of the VEGP SER:

> *In Section 16.1.1 of the BLN COL FSAR, the applicant provided additional information in BLN COL 16.1-1 to resolve COL Information Item 16.1-1 (COL Action Item 16.2-1) listed under the Section 16.1.1 header, "Combined License Information," of the AP1000 DCD, Revision 17, which states:*

This set of technical specifications is intended to be used as a guide in the development of the plant-specific technical specifications. The preliminary information originally provided in brackets [ ] has been revised with the updated information APP-GW-GLR-064 and APP-GW-GLN-075. Combined License applicants referencing the AP1000 will be required to provide the final information for the remaining brackets [ ] with final plant-specific information.

In Section 16.1 of the BLN COL FSAR, the applicant noted that the GTS and Bases provided with Chapter 16 of the AP1000 DCD are incorporated by reference into the PTS provided in Part 4 of the BLN COL application.

The staff evaluated the applicant's disposition of each of the remaining bracketed information items in the respective TS sections listed below.

The staff did not review portions of the BLN PTS and Bases that were identical to the AP1000 GTS and Bases. The technical evaluation for those portions that are identical to the AP1000 GTS and Bases can be found in the NRC staff's FSER for the AP1000 DCD.

16.1.4.1 Use and Application

Section 1.0 of the BLN PTS includes definitions of terms used in the context of plant TS, and examples to illustrate the applications of logical connectors, completion times for required actions, and frequencies for surveillance requirements (SRs). Section 1.0 of the BLN PTS is identical to the AP1000 GTS. There is no site-specific information that the applicant needed to provide to complete this section.

16.1.4.2 Safety Limits

Section 2.0 of the BLN PTS and Bases include[s] requirements for safety limits to ensure that the fuel design limits are not exceeded during steady state conditions, normal operational transients, and anticipated operational occurrence. Section 2.0 of the BLN PTS and Bases are [is] identical to the AP1000 GTS and Bases. There is no site-specific information that the applicant needed to provide to complete this section.

16.1.4.3.0 Limiting Condition for Operation and Surveillance Requirement Applicability

The following portion of this technical evaluation section is reproduced from Section 16.1.4.3 of the BLN SER:

Section 3.0 of the BLN PTS and Bases include[s] general provisions regarding determination of equipment operability and performance of SRs in specific TS sections (i.e., TS 3.1 through TS 3.9). Section 3.0 of the BLN PTS and Bases are [is] identical to the AP1000 GTS and Bases. There is no site-specific information that the applicant needed to provide to complete this section.

16.1.4.3.1 Reactivity Control Systems

The following portion of this technical evaluation section is reproduced from Section 16.1.4.4 of the BLN SER:

Section 3.1 of the BLN PTS and Bases include[s] requirements for the reactivity control systems which are designed to reliably control reactivity changes, and under postulated accident conditions, ensure that the capability to cool the core is maintained. Section 3.1 of the BLN PTS and Bases are [is] identical to the AP1000 GTS and Bases. There is no site-specific information that the applicant needed to provide to complete this section.

16.1.4.3.2 Power Distribution Limits

The following portion of this technical evaluation section is reproduced from Section 16.1.4.5 of the BLN SER:

Section 3.2 of the BLN PTS and Bases include[s] requirements for the reactor core power distribution limits which are designed to reliably control core thermal limits and core power distribution consistent with the design safety analysis. Section 3.2 of the BLN PTS and Bases are [is] identical to the AP1000 GTS and Bases. There is no site-specific information that the applicant needed to provide to complete this section.

16.1.4.3.3 Instrumentation

The following portion of this technical evaluation section is reproduced from Section 16.1.4.6 of the BLN SER:

Section 3.3 of the BLN PTS and Bases include[s] requirements for the instrumentation systems that display information required to protect against violating core fuel design limits and reactor coolant system (RCS) integrity, and to mitigate accidents.

The BLN instrumentation will be selected after COL issuance, and therefore, in accordance with COL/DC-ISG-8, "Necessary Content of Plant-Specific Technical Specifications When a Combined License is Issued," all trip setpoints and allowable values must be established through a staff-approved administrative control TS that specifies use of an NRC-approved methodology for determining the trip setpoints and allowable values, and a document controlled by 10 CFR 50.59 for recording this information. The trip setpoints and allowable values, referred to in Tables 3.3.1-1 and 3.3.2-1, will be determined after selection of specific instrumentation.

Request for additional information (RAI) 16-1 was issued in accordance with COL/DC-ISG-8, and requested that the applicant identify the method of determining the trip setpoints and allowable values, as well as establish an associated document in which to record the site-specific values and other restrictions necessary to satisfy 10 CFR 50.36. The applicant should clarify that after selection of specific instrumentation, the trip setpoints and allowable values, referred to in Tables 3.3.1-1 and 3.3.2-1, will be calculated using the setpoint

control program that specifies the approved methodology (i.e., WCAP-16361, APP-PMS-JEP-001, Revision 0, May 2006, "Westinghouse Setpoint Methodology for Protection Systems – AP1000"). In addition, the applicant should propose a setpoint control program to be added in the Administrative Control section of the TS, as stated in COL/DC-ISG-8. ***This is identified as Open Item 16.1-1****.*

Resolution of Standard Content Open Item 16.1-1

Resolution of this issue was brought forward at a public meeting on September 3, 2009, attended by the staff, Westinghouse, and the AP1000 COL applicants. Westinghouse committed to provide an acceptable setpoint control program in the AP1000 DC amendment application, which would then be adoptable by any COL applicants. This program was submitted to the staff in a letter dated February 19, 2010, and revised on May 6, 2010. The review of this program is documented in a supplement to NUREG-1793.

The applicant, in its May 21, 2010, supplemental response to this open item, committed to calculate trip setpoints and allowable values using the approved methodology cited above and to incorporate the AP1000 DCD setpoint control program in the Administrative Controls section of its PTS. The staff finds this response acceptable, since it ensures the applicant will use approved methodologies and a comprehensive administrative program to calculate setpoint values. The incorporation of this program into the VEGP TS in a later revision is ***Confirmatory Item 16.1-1.***

Resolution of Standard Content Confirmatory Item 16.1-1

Confirmatory Item 16.1-1 is an applicant commitment to revise its PTS to incorporate the AP1000 DCD setpoint control program in the Administrative Controls section of its PTS. The staff verified that the PTS was appropriately revised. As a result, Confirmatory Item 16.1-1 is now closed.

16.1.4.3.4 Reactor Coolant System

The following portion of this technical evaluation section is reproduced from Section 16.1.4.7 of the BLN SER:

Section 3.4 of the BLN PTS and Bases include[s] requirements for various RCS parameters (i.e., pressure, temperature, flow, etc.) and subsystems (i.e., RCS loops, pressurizer, low-temperature overpressure protection, etc.) to ensure the fuel integrity and the RCPB [reactor coolant pressure boundary] integrity are preserved during all modes of plant operation. Section 3.4 of the BLN PTS and Bases are [is] identical to the AP1000 GTS and Bases. There is no site-specific information that the applicant needed to provide to complete this section.

16.1.4.3.5 Emergency Core Cooling Systems

The following portion of this technical evaluation section is reproduced from Section 16.1.4.8 of the BLN SER:

Section 3.5 of the BLN PTS and Bases include[s] requirements for the safety-related passive core cooling system, which is designed to perform emergency core decay heat removal, RCS emergency makeup and boration, and safety injection. Section 3.5 of the BLN PTS and Bases are [is] identical to the AP1000 GTS and Bases. There is no site-specific information that the applicant needed to provide to complete this section.

16.1.4.3.6 Containment Systems

The following portion of this technical evaluation section is reproduced from Section 16.1.4.9 of the BLN SER:

Section 3.6 of the BLN PTS and Bases include[s] requirements for the containment systems, which are designed to shield [contain] fission products that may be in the containment atmosphere following accident conditions. Section 3.6 of the BLN PTS and Bases are [is] identical to the AP1000 GTS and Bases, except for the deletion of a reviewer's note. For TS 3.6.4, the reviewer's note is not applicable to the PTS, and the applicant has appropriately removed the information. This is acceptable to the staff. There is no site-specific information that the applicant needed to provide to complete this section.

16.1.4.3.7 Plant Systems

The following portion of this technical evaluation section is reproduced from Section 16.1.4.10 of the BLN SER:

Section 3.7 of the BLN PTS and Bases include[s] requirements for various systems in the secondary side of the steam generators (i.e., the main steam safety valves, the main steam isolation valves, the main feedwater isolation valves, etc.), the spent fuel pool water level and makeup systems, and the main control room habitability system. Section 3.7 of the BLN PTS and Bases are [is] identical to the AP1000 GTS and Bases. There is no site-specific information that the applicant needed to provide to complete this section.

16.1.4.3.8 Electrical Power Systems

The following portion of this technical evaluation section is reproduced from Section 16.1.4.11 of the BLN SER:

Section 3.8 of the BLN PTS and Bases include[s] requirements for the plant electrical systems that provide redundant, diverse and dependable power sources for all plant operating conditions. In the event of a total loss of off-site power, batteries and back-up on-site diesel generators are provided to supply electrical power equipment necessary for the safe shutdown of the plant. Section 3.8 of the BLN PTS and Bases are [is] identical to the AP1000 GTS and

Bases. There is no site-specific information that the applicant needed to provide to complete this section.

16.1.4.3.9 Refueling Operations

The following portion of this technical evaluation section is reproduced from Section 16.1.4.12 of the BLN SER:

Section 3.9 of the BLN PTS and Bases include[s] requirements for boron concentration, unborated water sources, nuclear instrumentation, containment penetrations, and water inventory in the refueling pool during Mode 6. Section 3.9 of the BLN PTS and Bases are [is] identical to the AP1000 GTS and Bases. There is no site-specific information that the applicant needed to provide to complete this section.

16.1.4.4 *Design Features*

Section 4.0 of the VCSNS PTS includes other design features not covered elsewhere in the PTS such as the site location, the site maps, and other information related to core design and fuel storage design. Section 4.0 of the VCSNS PTS is identical to the AP1000 GTS except for site-specific information provided by the applicant. In Section 4.1, the applicant provided the VCSNS site location information to replace the bracketed information in the GTS. The staff found the added information acceptable since it is consistent with related information found in FSAR Section 2.1.1, and in accordance with guidance provided in the GTS. In Section 4.1.1, the applicant provided Figure 4.1-2 which describes its site boundary and exclusion area boundary. The staff found the added information acceptable since it is consistent with related information found in VCSNS COL FSAR Sections 2.1.1.2 and 2.1.1.3, and in accordance with the guidance provided in the GTS. In Section 4.1.2, the applicant also provided the site location in Figure 4.1-1 and a description of the radius which establishes its low population zone. The staff found the added information acceptable since it is consistent with related information found in VCSNS COL FSAR Section 2.1.3, and is in accordance with the guidance provided in the GTS.

The following portion of this technical evaluation section is reproduced from Section 16.1.4.5 of the VEGP SER:

16.1.4.5 <u>Administrative Controls</u>

The following portion of this technical evaluation section is reproduced from Section 16.1.4.14 of the BLN SER:

This section of the BLN PTS includes provisions, which address various administrative controls related to plant key personnel responsibilities, plant procedures, special programs and reports, etc., to ensure the plant is safely operated. As discussed in Section 16.1.4.6 above, [VCSNS SER Section 16.1.4.3.3,] *the BLN instrumentation will be selected after COL issuance, and therefore, in accordance with COL/DC-ISG-8, all trip setpoints and allowable values must be established through a staff-approved administrative control TS that specifies use of an NRC-approved methodology for determining the trip setpoints and allowable values, and a document controlled by 10 CFR 50.59 for recording this information. The trip setpoints and allowable values, referred to in*

Tables 3.3.1-1 and 3.3.2-1, will be determined after selection of specific instrumentation.

The staff issued RAI 16-1 and requested that the applicant identify the method of determining the trip setpoints and allowable values, as well as establish an associated document in which to record the site-specific values and other restrictions necessary to satisfy 10 CFR 50.36. The applicant should clarify that after selection of specific instrumentation, the trip setpoints and allowable values, referred to in Tables 3.3.1-1 and 3.3.2-1, will be calculated using the setpoint control program that specifies the approved methodology (i.e., WCAP-16361, APP-PMS-JEP-001, Revision 0, May 2006, "Westinghouse Setpoint Methodology for Protection Systems – AP1000"). In addition, the applicant should propose a setpoint control program to be added in the Administrative Control section of the TS, as stipulated in COL/DC-ISG-8. ***This is identified as Open Item 16.1-1****.*

Resolution of Standard Content Open Item 16.1-1

The resolution of this issue is discussed in the evaluation of Section 16.1.4.3.3, "Instrumentation," above. The applicant committed to adopting the setpoint control program approved in the AP1000 DC, which would be verified in a future revision of the VEGP TS. This is ***Confirmatory Item 16.1-1****.*

Resolution of Standard Content Confirmatory Item 16.1-1

Confirmatory Item 16.1-1 is an applicant commitment to revise its PTS to incorporate the AP1000 DCD setpoint control program in the Administrative Controls section of its PTS. The staff verified that the PTS was appropriately revised. As a result, Confirmatory Item 16.1-1 is now closed.

The following portion of this technical evaluation section is reproduced from Section 16.1.4.14 of the BLN SER:

In Section 5.3.1 of the BLN PTS, the applicant replaced the GTS bracketed information, clarifying that each member of the unit staff shall meet or exceed minimum qualifications of RG [Regulatory Guide] *1.8, Revision 3 except for during cold license operator training where portions of RG 1.8, Revision 2 will apply. The staff finds this acceptable because RG 1.8, Revision 3 does not address cold license operator training. In other respects, Sections 5.0, 5.1.1, 5.1.2, 5.2.1a, 5.2.1b, 5.2.2, 5.3, 5.6.1, and 5.6.2 of the BLN PTS are identical to the AP1000 GTS, except for site-specific information provided by the applicant to replace the bracketed information in the GTS. The site-specific information provided was administrative in nature and the staff found it acceptable.*

In Section 5.2.2 of the VEGP PTS, the applicant proposed to remove the brackets around the COL item related to unit staff organization, as well as removing work hour restrictions in TS 5.2.2.d. The applicant refers to 73 Federal Register (FR) 79923 which provides the NRC's model application for adopting TSTF-511, Revision 0, "Eliminate Working Hour Restrictions from TS 5.2.2 to Support Compliance with 10 CFR Part 26 ["Fitness for Duty Programs"]*." The staff finds this deletion acceptable since it conforms to the guidance provided in*

the TSTF and working hour restrictions in 10 CFR Part 26, and therefore, is no longer required to be in the TS. This appropriately meets the intent of completing this bracketed information.

16.1.5 Post Combined License Activities

There are no post-COL activities related to this section.

16.1.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the VCSNS PTS and Bases, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

For the reasons set forth above the staff finds that Section 16.1 of the VCSNS COL FSAR and Part 4 of the VCSNS COL application are acceptable and satisfy the requirements of 10 CFR 50.36; 10 CFR 50.36a, "Technical specifications on effluents from nuclear power reactors"; and 10 CFR 52.79(a)(30).

16.2 Design Reliability Assurance Program (Related to RG 1.206, Section C.III.1, Chapter 17, C.I.17.4, "Reliability Assurance Program Guidance")

The D-RAP comprises the reliability assurance activities that assure that the plant is consistent with the certified design when fuel is loaded for the first time.

Section 16.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 16.2, "Design Reliability Assurance Program," of Revision 19 of the AP1000 DCD, which in turn refers to Section 17.4 for a description of the program. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The NRC staff's review of the applicant's D-RAP is documented in Section 17.4 of this SER.

16.3 Investment Protection

16.3.1 Introduction

The AP1000 design includes active systems that provide defense in depth capabilities (identified as "investment protection" by the applicant) for RCS makeup and decay heat removal. These active systems are the first line of defense in reducing challenges to the passive systems in the event of transients or plant upsets. Most active systems in the AP1000 design are designated as non-safety-related. Because some active systems reduce challenges to safety-related systems to a significant degree, short-term availability controls are necessary to provide reasonable assurance that these SSCs are operable during anticipated events.

A detailed evaluation of the regulatory treatment of non-safety systems for the AP1000 design, and the concept of investment protection, is addressed in Chapter 22 of NUREG-1793.

16.3.2 Summary of Application

Section 16.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 16.3 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 16.3, the applicant provided the following:

AP1000 COL Information Item

- STD COL 16.3-1

The applicant provided additional information in Standard (STD) COL 16.3-1 to address COL Information Item 16.3-1. This item is related to the development of a procedure to control the operability of investment protection SSCs.

16.3.3 Regulatory Basis

The regulatory basis of the information incorporated by reference, and the additional information presented in this application, is addressed in the FSER related to the DCD.

16.3.4 Technical Evaluation

The NRC staff reviewed Section 16.3 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to SSCs required for defense in depth. The results of the NRC staff's evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference

COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 16.3.4 of the VEGP SER:

> *AP1000 COL Information Item*
>
> - *STD COL 16.3-1*
>
> *The applicant provided supplemental information by adding the following statement to DCD Section 16.3-1:*
>
> > *Station procedures govern and control the operability of investment protection systems, structures, and components in accordance with Table 16.3-2 of the DCD, and provide the operating staff with instruction for implementing required actions when operability requirements are not met. Procedure development is addressed in FSAR Section 13.5.*
>
> *Section 22.5.9 of the NRC staff's FSER related to the DCD (NUREG-1793) evaluated the short-term availability controls proposed by Westinghouse for important non-safety-related SSCs. The NRC staff concluded that the administrative controls for the SSCs required for defense in depth, listed in Table 16.3-2 of the AP1000 DCD, were acceptable. COL applicants referencing the AP1000 are responsible for developing a procedure to control the operability of these SSCs in accordance with DCD Table 16.3-2 (COL Information Item 16.3.2-1* [16.3-1]*).*
>
> *The applicant's response to STD COL 16.3-1 is acceptable because there were no exceptions taken to the list of SSCs required for defense in depth nor to the administrative procedures included in AP1000 DCD Table 16.3-2. The applicant also committed to place this information in station procedures. The information in DCD Table 16.3-2 also provides the operating staff with instruction for implementing required actions when operability requirements are not met.*

16.3.5 Post Combined License Activities

There are no post-COL activities related to this section.

16.3.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information related to defense in depth using non-safety-related SSCs, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable based on the regulatory basis addressed in NUREG-1793. The staff based its conclusion on the following:

- STD COL 16.3-1, as related to SSCs required for defense in depth, is acceptable because it states that station procedures will govern and control the operability of these SSCs, in accordance with Table 16.3-2 of the AP1000 DCD, without exceptions. The information in DCD Table 16.3-2 also provides the operating staff with guidance for taking required actions when operability requirements are not met.

17.0 QUALITY ASSURANCE (RELATED TO RG 1.206, SECTION C.III.1, CHAPTER 17, C.I.17, "QUALITY ASSURANCE AND RELIABILITY ASSURANCE")

The quality assurance (QA) program for design, fabrication, construction, testing, and operation, design reliability program, and maintenance rule (MR) program are discussed in this chapter.

17.1 Quality Assurance During the Design and Construction Phases

17.1.1 Introduction

The QA program related to design and construction activities is discussed in this section. It addresses the QA program implemented during combined license (COL) application development, including site characterization activities, design and construction phases.

17.1.2 Summary of Application

Section 17.1 of the V.C. Summer Nuclear Station (VCSNS) COL Final Safety Analysis Report (FSAR), Revision 5, incorporates by reference Section 17.1 of the AP1000 Design Control Document (DCD), Revision 19.

In addition, in VCSNS COL FSAR Section 17.1, the applicant provided the following:

AP1000 COL Information Item

- VCS COL 17.5-1

The applicant provided additional information in VCS COL 17.5-1 to address COL Information Item 17.5-1. In VCS COL 17.5-1, the applicant addresses the quality assurance program description (QAPD) under which the COL application was developed for the design and construction phases up until COL issuance. Section 17.5 of the VCSNS COL FSAR addresses the QA program for the remaining portion of the design and construction phases following COL issuance.

17.1.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," and its supplements.

In addition, the relevant requirements of the Commission regulations for the resolution of VCS COL 17.5-1 are established in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic licensing of production and utilization facilities," Appendix B, "Quality assurance criteria for nuclear power plants and fuel reprocessing plants," as required by 10 CFR 52.79(a)(25).

17.1.4 Technical Evaluation

The Nuclear Regulatory Commission (NRC) staff reviewed Section 17.1 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the

COL application represents the complete scope of information relating to this review topic.[23] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to QA during design and construction phases. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this safety evaluation report (SER) provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the design certification (DC) and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (Vogtle Electric Generating Plant (VEGP), Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs).

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application. Any confirmatory items in the standard content material retain the numbers assigned in the VEGP SER. Confirmatory items that are first identified in this SER section have a VCSNS designation (e.g., Confirmatory Item VCSNS 17.1-1).

The staff reviewed the information in the VCSNS COL FSAR:

AP1000 COL Information Item

- VCS COL 17.5-1

The NRC staff reviewed the partial resolution of VCS COL 17.5-1 related to QA during the design and construction phases until COL issuance included under Section 17.1 of the VCSNS COL FSAR. The remaining information for VCS COL 17.5-1 is included in Section 17.5 of the VCSNS COL FSAR. The staff's review of VCS COL 17.5-1 is a combination of plant-specific evaluation and standard content evaluation.

The applicant replaced information in the AP1000 DCD, Section 17.1 with new text to address the QA program requirements for design and construction activities implemented from COL

[23] See Section 1.2.2 for a discussion of the staff's review related to verification of the scope of information to be included in a COL application that references a DC.

application development through operations. Upon review of the additional text provided by the applicant, the NRC staff identified areas where additional information was needed.

In RAI 17.1-1, dated December 31, 2008, the NRC staff requested that the applicant describe NuStart's scope of work, related to VCSNS COL application development activities, and to identify the specific provisions in VCSNS's QA program that govern such development activities. In its letters dated February 2, 2009, and July 2, 2009, the applicant proposed to include in Section 17.1 of the VCSNS COL FSAR, a description of the NuStart's scope of work for preparing the VCSNS COL application. The applicant described NuStart's purpose as two-fold. The first was to demonstrate compliance with the licensing process as defined by 10 CFR Part 52, "Licenses, Certifications and Approvals for Nuclear Power Plants," and the second was to work with contractors in completing the engineering work for the standardized plant designs. The applicant stated that the design activities during COL application development, through and until COL issuance, are and will be conducted in accordance with the NuStart QA plan, and applicable Westinghouse and Bechtel QA programs. Further, the applicant described that the process of collection, review, and analysis of specific data for site characterization was performed for South Carolina Electric and Gas (SCE&G) by Bechtel Power Corporation under the Bechtel Power Corporation QA Manual. The applicant described that SCE&G maintains oversight of its contractors' activities under its existing Appendix B to 10 CFR Part 50 QA Program described in the VCSNS Unit 1 operational QA plan. The NRC staff has reviewed the applicant's proposed revision to Section 17.1 of the VCSNS COL FSAR and determined that the proposed revision adequately described NuStart's scope of work utilized in the VCSNS COL application. The NRC staff verified that the applicant has incorporated the response in the VCSNS COL FSAR; therefore, RAI 17.1-1 is closed.

In RAI 17.1-2, dated December 31, 2008, the NRC staff requested that the applicant clarify the meaning of "QA program will evolve in a phased approach" as described in Section 17.1 of the VCSNS COL FSAR and clarify when the QAPD described in Section 17.5 of the VCSNS COL FSAR will be fully implemented. In its letter dated February 2, 2009, the applicant stated that the SCE&G Quality Assurance Program Description begins at COL issuance, and establishes the QA program requirements for the remaining portion of the design and construction phases. However, full implementation of operations-related requirements is not expected until 30 days prior to fuel load, as indicated in FSAR Table 13.4-201. Accordingly, as part of its response to RAI 17.1-1, the applicant proposed to revise the last paragraph of Section 17.1 of the VCSNS COL FSAR to state:

> Implementation of the applicable portions of the "Quality Assurance Program Description" (QAPD) discussed in Section 17.5 begins at COL issuance. The program establishes the quality assurance program requirements for the remaining portion of the design and construction phases and for operations, full implementation of the operations related requirements will be no later than as indicated in FSAR Table 13.4-201.

The NRC staff has reviewed the applicant's proposed revision to Section 17.1 of the VCSNS COL FSAR and determined that the implementation schedule for the QAPD is acceptable. The NRC staff verified that the applicant has incorporated the proposed response in the VCSNS COL FSAR; therefore, RAI 17.1-2 is closed.

In RAI 17.1-3, dated December 31, 2008, the NRC staff requested that the applicant revise Section 17.1 of the VCSNS COL FSAR to clearly state SCE&G's responsibility for the establishment and execution of QA program requirements during the design and construction

phases of VCSNS Units 2 and 3. Further, the NRC staff requested the applicant reference in the VCSNS COL FSAR, the revision and date of the current QA program that has been implemented during the preparation of the COL application and up through COL issuance.

In its letter dated February 2, 2009, the applicant stated that its response to RAI 17.1-1 addresses the issues identified in RAI 17.1-3. Specifically, the applicant agreed to include in Section 17.1 of the VCSNS COL FSAR, a description of SCE&G's responsibilities for establishing and executing the QA program requirements during the design and construction phases of VCSNS Units 2 and 3. Further, on July 2, 2009, the applicant supplemented its response to RAI 17.1-1 to revise Section 17.8 of the VCSNS COL FSAR to include the revisions and dates of the QA programs implemented during the preparation of the COL application and up through COL issuance. The NRC staff verified that the applicant has incorporated the proposed revisions to Sections 17.1 and 17.8 in the VCSNS COL FSAR; therefore, RAI 17.1-3 is closed.

In RAI 17.1-4, dated December 31, 2008, the NRC staff requested that the applicant clarify the term "interim version" of the QA program described in Section 17.5, and explain when such safety-related operational activities will be executed. In its letter dated February 2, 2009, the applicant, in order to alleviate any confusion, proposed to delete the last paragraph using the term "interim version," from Section 17.1 of the VCSNS COL FSAR. The applicant stated that the clarification as to full implementation of the operations related requirements has been addressed in response to RAI 17.1-1. As part of the response to RAI 17.1-1, the applicant described that the implementation of applicable portions of the QAPD will begin at COL issuance and full implementation of safety-related operational activities will begin no later than as indicated in Table 13.4-201. The NRC staff has reviewed the proposed revision to Section 17.1 of the VCSNS COL FSAR, and determined that the implementation schedule for the QAPD is acceptable. The NRC staff verified that the applicant has incorporated the proposed response in the VCSNS COL FSAR; therefore, RAI 17.1-4 is closed.

In RAI 17.5-6, dated December 31, 2008, the NRC staff requested that the applicant perform an evaluation of the existing VCSNS Unit 1 QA program against the acceptance criteria in Section 17.1 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants." In its letters, dated February 2, 2009 and December 1, 2009, the applicant stated that the Unit 1 operational QA program was reviewed and evaluated by the NRC and found acceptable utilizing the acceptance criteria in NUREG-0800, Section 17. The applicant also stated that the QAPD described in Section 17.5 of the VCSNS COL FSAR will apply after COL issuance and that the QAPD has been evaluated and discussed in Table 1.9-202 of the VCSNS COL FSAR for conformance to NUREG-0800, Section 17.1. The NRC staff has reviewed the response and determined that the applicant's response is acceptable; therefore, RAI 17.5-6 is closed.

The NRC staff also reviewed Appendix 1AA of the VCSNS COL FSAR, which lists VCSNS's conformance with NRC regulatory guides (RGs) and provides any exceptions to conformance with those RGs. In RAI 17.5-7, dated December 31, 2008, the NRC staff requested that the applicant explain how Appendix 1AA addresses the existing VCSNS Unit 1 QA program's conformance to the applicable RGs. In its letters dated February 2, 2009, and February 25, 2010, the applicant stated that after COL issuance, the VCSNS Unit 1 regulatory guides applicable to Units 2 and 3 pre-COL activities will not apply; hence, VCSNS Unit 1 QA program will not be listed in Appendix 1AA. In a supplementary response letter dated December 1, 2009, to RAI 17.5-6, the applicant provided additional information to RAI 17.5-7 in which the applicant described that the Unit 1 QA program invokes RG 1.28, "Quality Assurance

Program Criteria (Design and Construction)," Revision 0, and after COL issuance, the QAPD for Units 2 and 3 will conform to RG 1.28, Revision 3, with the exception statement that the QA requirements will conform to NQA-1-1994, "Quality Assurance Requirements for Nuclear Facility Applications." The applicant also proposed to revise Appendix 1AA to include SCE&G Unit 1 QA program requirements conformance with RG 1.28. In a letter dated May 24, 2010, the applicant agreed with the NRC staff's proposal to include a statement in Section 17.1 of the VCSNS COL FSAR that the Unit 1's QA program conforms with RG 1.28, Revision 0. The NRC staff has reviewed the proposed revisions to Section 17.1 and Appendix 1AA of the VCSNS COL FSAR and determined that the proposed revisions are acceptable. This item is identified as **Confirmatory Item VCSNS 17.1-1**, pending formal revision of the VCSNS COL application.

Resolution of Confirmatory Item VCSNS 17.1-1

Confirmatory Item VCSNS 17.1-1 is an applicant commitment to revise its FSAR Appendix 1AA and Section 17.1. The staff verified that the VCSNS COL FSAR was appropriately updated. As a result, Confirmatory Item VCSNS 17.1-1 is now closed.

The following portion of this technical evaluation section is reproduced from Section 17.1.4 of the VEGP SER:

> *In addition, the applicant proposed revisions to Appendix 1AA in its letter, dated August 19, 2008, in response to the NRC staff's RAI 1-5. In its response, the applicant proposed to change the exception statements to address the version of NQA-1 instead of addressing the QAPD included in Part 11 of the BLN COL application. The NRC staff has verified that the proposed revision was incorporated into Revision 1 of the BLN COL FSAR for those RGs with QA requirements. RAI 1-5 is closed for all RGs that contain exception statement referencing NQA-1 (i.e., RG 1.28, 1.30, 1.38, 1.39, 1.94, and 1.116) except for RG 1.33.*
>
> *In RAI 01-11, dated December 16, 2008, the NRC staff requested that the applicant document the mechanism for incorporation of the requirements of RG 1.33 since these requirements are not covered by NQA-1. In its letter, dated January 27, 2009, the applicant stated that conformance with RG 1.33 will be supplemented in a future amendment to include a reference to Nuclear Energy Institute (NEI) 06-14A. The NRC staff has addressed this issue with NEI since NEI 06-14A does not commit to RG 1.33. This issue will remain open until closure is reached with NEI 06-14A or the applicant. This is identified as* ***Open Item 17.1-1****.*
>
> *Resolution of Standard Content Open Item 17.1-1*
>
> *In its letter, dated December 31, 2009, the applicant proposed to revise VEGP COL FSAR Section 1.9, Table 1.9-201, "Regulatory Guide/FSAR Section Cross-References," to document that RG 1.33, "Quality Assurance Program Requirements (Operation)," Revision 2, is addressed in Section IV of the QAPD. Additionally, the applicant proposed to revise Appendix 1AA of the VEGP COL FSAR to document conformance to RG 1.33. Therefore, Open Item 17.1-1 is resolved for VEGP and the proposed revisions are identified as* ***Confirmatory Item 17.1-1****, pending formal revision of the VEGP COL FSAR.*

Resolution of Standard Content Confirmatory Item 17.1-1

Confirmatory Item 17.1-1 is an applicant commitment to revise its FSAR Table 1.9-201 and Appendix 1AA to document conformance to RG 1.33. The staff verified that the VEGP COL FSAR was appropriately updated. As a result, Confirmatory Item 17.1-1 is now closed.

In June 2009, the NRC staff conducted a limited scope inspection at the SCE&G's facility in Jenkinsville, South Carolina, as documented in inspection report numbers 05200027/2009-201 and 05200028/2009-201 dated July 15, 2009. The purpose of the NRC inspection was to verify that the QA processes and procedures were effectively implemented with regards to the VCSNS COL application. In this inspection, the NRC inspectors identified one violation of NRC requirements related to the QA program. SCE&G responded to the Notice of Violation (NOV) in a letter dated August 6, 2009. SCE&G identified its actions to correct and prevent recurrence of the violation and noted that full compliance was achieved. Based on the NOV and SCE&G's response, the staff does not intend to conduct a follow-up inspection as part of licensing.

17.1.5 Post Combined License Activities

There are no post-COL activities related to this section.

17.1.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to QA during the design and construction phase, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Based on the information provided by the applicant, the staff concludes that VCS COL 17.5-1 meets Appendix B to 10 CFR Part 50 and 10 CFR 52.79(a)(25) requirements.

17.2 Quality Assurance During the Operations Phase

Section 17.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 17.2 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

17.3 Quality Assurance During Design, Procurement, Fabrication, Inspection, and/or Testing of Nuclear Power Plant Items (Related to RG 1.206, Section C.III.1, Chapter 17, C.I.17.3, "Quality Assurance Program Description")

Section 17.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 17.3 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding

issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

17.4 Design Reliability Assurance Program (Related to RG 1.206, Section C.III.1, Chapter 17, C.I.17.4, "Reliability Assurance Program Guidance")

17.4.1 Introduction

This reliability assurance program (RAP) provides reasonable assurance that a plant is designed, constructed, and operated in a manner that is consistent with the assumptions and risk insights related to structures, systems, and components (SSCs) that are identified as being significant contributors to plant safety as determined by using probabilistic, deterministic, or other methods of analysis. The information is obtained from sources such as the plant- and site-specific probabilistic risk assessment (PRA), industry operating experience, relevant component failure databases, and expert panels.

The RAP is implemented in two stages. The first stage, the design reliability assurance program (D-RAP), comprises the reliability assurance activities providing confidence that the plant is consistent with the certified design when fuel is loaded for the first time. The second stage comprises the operational phase reliability assurance activities (OPRAAs) that are to be integrated into other programs.

17.4.2 Summary of Application

Section 17.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 17.4 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 17.4, the applicant provided the following:

Supplemental Information

- STD SUP 17.4-1

The applicant provided supplemental (SUP) information in standard (STD) SUP 17.4-1 regarding the QA requirements for nonsafety-related SSCs within the scope of D-RAP.

17.4.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for the D-RAP are given in Section 17.4 of NUREG-0800. SECY-95-132, "Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems in Passive Plant Designs," states the following:

> An application for advanced reactor DC or a COL must include: (1) the description of the RAP used during the design that includes, scope, purpose, and objectives; (2) the process used to evaluate and prioritize the SSCs in the design, based on their degree of risk significance; (3) a list of the SSCs

designated as risk significant; and (4) for those SSCs designated as risk significant: (i) a process to determine dominant failure modes that considered industry experience, analytical models, and applicable requirements; and (ii) key assumptions and risk insights from probabilistic, deterministic, or other methods that considered operations, maintenance, and monitoring activities.

Each licensee that references the advanced reactor design must implement the design reliability assurance program approved by the NRC.

The Commission approved this position in the associated staff requirements memorandum (SRM) dated June 28, 1995.

RG 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)," describes an acceptable way to satisfy these requirements.

17.4.4 Technical Evaluation

The NRC staff reviewed Section 17.4 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the D-RAP. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 17.4.4 of the VEGP SER:

Supplemental Information

- *STD SUP 17.4-1*

The applicant provided supplemental information in STD SUP 17.4-1 to describe the QA requirements for nonsafety-related SSCs within the scope of D-RAP.

The following portion of this technical evaluation section is reproduced from Section 17.4.4 of the BLN SER:

No site specific structures, systems, and components (SSCs) have been added to the D-RAP. The applicant asserts that the AP1000 DCD and PRA bound all site specific hazards and associated risks. The staff's evaluation of the probabilistic methods used to reach this conclusion is documented in Chapter 19 of this safety evaluation. The staff concludes that the list of SSCs incorporated by reference to the DCD is an acceptable list for the BLN COL.

The staff noted that risk metrics may change with modifications to the plant design or other new information and requested additional information on how the applicant would address risk significant SSCs that are identified after the COL is issued (RAI 17.4-1). In its response dated September 17, 2008, the applicant stated that such changes would be captured and included in the appropriate OPRAAs in accordance with procedures developed under the QA program. In addition, the response states that the [Maintenance Rule] MR program is to be consistent with NEI 07-02A, "Generic FSAR Template Guidance for Maintenance Rule Program Description for Plants Licensed under 10 CFR Part 52," which has been endorsed by the staff in a letter to NEI, dated January 24, 2008.

The MR program description calls for establishment of an expert panel prior to fuel load. As additional information is developed, such a panel alters the scope of OPRAAs as appropriate. Because this provides assurance that changes will receive appropriate review, the staff finds it acceptable; therefore, RAI 17.4-1 is closed.

However, the staff requested that the applicant supplement the BLN COL FSAR to describe the organizational and process aspects of the RAP that will be performed by the COL holder (RAI 17.4-2). In its response dated April 9, 2009, the applicant proposed to revise the BLN COL FSAR Section 17.4 to include a standard supplement identifying the quality assurance requirements for non-safety-related SSCs within the scope of D-RAP. This is consistent with RG 1.206 and is therefore an acceptable method for meeting the Commission's policy for RAP. The staff identifies the need for a revision to the BLN COL FSAR as ***Confirmatory Item 17.4-1****.*

Resolution of Standard Content Confirmatory Item 17.4-1

Confirmatory Item 17.4-1 required the applicant to update its FSAR to include a standard supplement identifying the QA requirements for non-safety-related

SSCs within the scope of D-RAP. The NRC staff verified that the VEGP COL FSAR was appropriately updated with STD SUP 17.4-1. As a result, Confirmatory Item 17.4-1 is resolved.

17.4.5 Post Combined License Activities

There are no post-COL activities related to this section.

17.4.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to the D-RAP, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the relevant information presented in Section 17.4 of the VCSNS COL FSAR is consistent with the guidance provided in SECY-95-132, and the requirements of 10 CFR 52.47(b)(1) and 10 CFR 52.80(a). Therefore, the VCSNS D-RAP is acceptable.

17.5 Quality Assurance Program Description – New License Applicants (Related to RG 1.206, Section C.III.1, Chapter 17, C.I.17.5, "Quality Assurance Program Guidance")

17.5.1 Introduction

The QA program during the design, fabrication, construction, testing, and operation phases of a nuclear power plant is discussed in this section. Implementation of the applicable portions of the QAPD referenced in Section 17.5 begins at COL issuance with full implementation of the operations-related requirements consistent with VCSNS COL FSAR Table 13.4-201, "Operational Programs Required by NRC Regulations."

17.5.2 Summary of Application

In Part 13 of the VCSNS COL application, the applicant provided a QAPD to be in place during the design, construction, and operations phases. This QAPD will be incorporated by reference in Section 17.5 of the VCSNS COL FSAR.

In addition, in VCSNS COL FSAR Section 17.5, the applicant provided the following:

AP1000 COL Information Items

- VCS COL 17.5-1

The applicant provided additional information in VCS COL 17.5-1 to address COL Information Item 17.5-1. VCS COL 17.5-1 addresses the QA program in place during the design, construction, and operations phases.

- STD COL 17.5-2

The applicant provided additional information in STD COL 17.5-2 to address COL Information Item 17.5-2. STD COL 17.5-2 addresses QA programs for procurement, fabrication, installation, construction, and testing of SSCs in the plant.

- STD COL 17.5-4

The applicant provided additional information in STD COL 17.5-4 to address COL Information Item 17.5-4. STD COL 17.5-4 addresses the QA program for operations.

- STD COL 17.5-8

The applicant provided additional information in STD COL 17.5-8 to address COL Information Item 17.5-8. STD COL 17.5-8 addresses operational RAP integration with the QA program.

17.5.3 Regulatory Basis

The acceptance criteria associated with the relevant requirements of the Commission regulations for the QAPD are given in Section 17.5 of NUREG-0800.

The applicable regulatory requirements for the QAPD are as follows:

Appendix B to 10 CFR Part 50, requires that the application include a description of the QA program to be applied to the design, fabrication, construction, and testing of the SSCs of the facility and establishes QA requirements for the design, construction, and operation of those SSCs. The pertinent requirements of Appendix B apply to all activities affecting the safety-related functions of the SSCs, including designing, purchasing, fabricating, handling, shipping, storing, cleaning, erecting, installing, inspecting, testing, operating, maintaining, repairing, refueling, and modifying.

Section 10 CFR 52.79(a)(17) requires that the application include information with respect to compliance with technically relevant positions of the Three Mile Island requirements of 10 CFR 50.34(f).

Section 10 CFR 52.79(a)(25) requires that the description of the QA program include a discussion of how the applicable requirements of Appendix B have been and will be satisfied, and also include a discussion of how the QA program will be implemented.

Further, 10 CFR 52.79(a)(27) requires that the application include information on the managerial and administrative controls to be used for a nuclear power plant and include a discussion of how the applicable requirements of Appendix B will be satisfied.

17.5.4 Technical Evaluation

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application. Any confirmatory items in the standard content material retain the numbers assigned in the VEGP SER. Confirmatory items that are first identified in this SER section have a VCSNS designation (e.g., Confirmatory Item VCSNS 17.5-1).

Although the staff concluded that the evaluation performed for the standard content is directly applicable to the VCSNS COL application, there were differences between the information provided by the VCSNS applicant and that provided by the VEGP applicant regarding details in the FSAR and the QAPD. The resolutions of these differences for VCSNS are evaluated by the staff following the standard content material to which they apply.

The following portion of this technical evaluation section is reproduced from Section 17.5.4 of the VEGP SER:

> *The NRC staff reviewed Section 17.5 of the BLN COL FSAR and the QAPD provided in Part 11 of the BLN COL application. In RAI 17.5-9, dated May 12, 2008, the NRC staff requested that the applicant explain why the QAPD provided in Part 11 of the BLN COL application is not referenced or incorporated by reference in the BLN COL FSAR Section 17.5. In its letters, dated June 26, 2008, and October 16, 2008, the applicant proposed to revise Section 17.5 of the BLN COL FSAR to state that the QAPD is incorporated by reference. In addition, the applicant proposed to revise Section 17.5 of the BLN COL FSAR to provide the title of the QAPD that is incorporated by reference. The NRC staff has reviewed the proposed revisions to Section 17.5 and concluded that the proposed changes are responsive to RAI 17.5-9. The NRC staff has verified that the proposed revision was incorporated into Revision 1 of the BLN COL FSAR. RAI 17.5-9 is closed.*

The NRC staff has verified that the proposed revision to incorporate the QAPD by reference was incorporated into the VEGP COL FSAR. In its letter dated January 29, 2010, the applicant proposed to revise Section 17.5 of the VEGP COL FSAR to provide the title of the QAPD that is incorporated by reference. This item is identified as ***Confirmatory Item 17.5-1****, pending formal revision of the VEGP COL FSAR.*

Resolution of Standard Content Confirmatory Item 17.5-1

Confirmatory Item 17.5-1 is an applicant commitment to revise its FSAR Section 17.5 to specify the title of the QAPD. The staff verified that the VEGP COL FSAR was appropriately updated. As a result, Confirmatory Item 17.5-1 is now closed.

In a letter dated May 24, 2010, the applicant endorsed the standard content material provided by VEGP in its letters dated January 29, 2010, and April 2, 2010, with reference to BLN response to RAI 17.5-9 as standard, and proposed to incorporate the standard content in a future revision of the VCSNS COL FSAR. The applicant provided its commitment to incorporate the standard content material that consists of revising Section 17.5 of the VCSNS COL FSAR to incorporate the QAPD by reference and to provide the title of the QAPD that is incorporated by reference. The NRC staff reviewed the applicant's proposed commitment to incorporate the standard content with reference to the QAPD and determined the proposed commitment to be acceptable. This item is identified as **Confirmatory Item VCSNS 17.5-1**, pending formal revision of the VCSNS COL application.

Resolution of Confirmatory Item VCSNS 17.5-1

Confirmatory Item VCSNS 17.5-1 is an applicant commitment to revise its FSAR Section 17.5 to incorporate the QAPD by reference and specify its title. The staff verified that the VCSNS COL FSAR was appropriately updated. As a result, Confirmatory Item VCSNS 17.5-1 is now closed.

In addition, the NRC staff reviewed the resolution of COL information items STD COL 17.5-2, STD COL 17.5-4, STD COL 17.5-8, and VCS COL 17.5-1, which are addressed in the VCSNS QAPD. The VCSNS QAPD is based on NEI 06-14A, "Quality Assurance Program Description," Revision 7, which was approved by the NRC staff using Section 17.5 of NUREG-0800. The staff's review of these four COL items is a combination of plant-specific evaluation and standard content evaluation.

AP1000 COL Information Items

- STD COL 17.5-2, STD COL 17.5-4, STD COL 17.5-8 and VCS COL 17.5-1

The following portion of this technical evaluation section is reproduced from Section 17.5.4 of the VEGP SER:

The NEI 06-14A template provided generic information and format for QAPDs with bracketed areas for applicants to provide plant-specific information. The generic information in NEI 06-14A provides the information required for STD COL 17.5-2, 17.5-4, and 17.5-8. In its review of TVA QAPD, the NRC staff used Section 17.5 of NUREG-0800 and RG 1.206 as guidance. The NRC staff developed Section 17.5 of NUREG-0800 using American Society of Mechanical

Engineers (ASME) standard ASME NQA-1-1994, "Quality Assurance Requirements for Nuclear Facility Applications," as supplemented by additional regulatory and industry guidance for nuclear operating facilities.

During its review of SCE&G's QAPD, the staff identified an issue in the VCSNS QAPD that required further clarification. The staff issued RAI 17.5-1 requesting that the applicant identify the missing Section 2, "Quality Assurance Program," in the table of contents portion of the QAPD. In its response dated February 2, 2009, the applicant agreed to correct the missing Section 2, "Quality Assurance Program," in the table of contents of the VCSNS QAPD. The NRC staff reviewed the response and determined that the proposed change is acceptable. The NRC staff verified that the proposed revision has been incorporated into the VCSNS QAPD; therefore, RAI 17.5-1 is closed.

In RAI 17.5-3, dated December 31, 2008, the NRC staff requested that the applicant provide an explanation of how QAPD Part I Sections 1 and 1.1 are consistent in defining the scope of the QAPD. In a letter, dated February 2, 2009, the applicant proposed to revise VCSNS QAPD Part I Section 1 to state:

> SCE&G New Nuclear Deployment QAPD is the top-level policy document that establishes the quality assurance policy and assigns major functional responsibilities for COL/construction/pre-operation and operation activities conducted by or for SCE&G.

The applicant also proposed to revise SCE&G QAPD Part I Section 1.1 to state:

> This QAPD applies to COL, construction/pre-operation, and operations activities affecting the quality and performance of safety-related structures, systems, and components, including, but not limited to:

The NRC staff reviewed the response and determined that the proposed revision to VCSNS QAPD Part I Sections 1 and 1.1 to be acceptable, because the inconsistency was resolved. The NRC staff verified that the proposed revisions have been incorporated into the VCSNS QAPD; therefore, RAI 17.5-3 is closed.

In RAI 17.5-4, dated December 31, 2008, the NRC staff requested that the applicant provide clarification of how VCSNS siting activities, as described in QAPD Part I, Section 1.1, would be subject to the provisions of the QAPD, since siting activities would be complete at the time of COL issuance. In its letter dated February 2, 2009, the applicant proposed to delete siting activities from Part I, Section 1.1 of the VCSNS QAPD. The NRC staff reviewed the response and determined the proposed revision to Part I, Section 1.1 of the VCSNS to be acceptable. The NRC staff verified that the proposed revisions have been incorporated in the VCSNS COL FSAR; therefore, RAI 17.5-4 is closed.

Further NRC staff evaluation of the COL review items and the SCE&G QAPD is provided in the following sections.

17.5.4.1 *Organization*

The following portion of this technical evaluation section is reproduced from Section 17.5.4.1 of the VEGP SER:

> *TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.A. The QAPD describes and defines the responsibility and authority for planning, establishing, and implementing an effective overall QA program. The QAPD provides a description of an organizational structure, functional responsibilities, levels of authority, and interfaces for establishing, executing, and verifying QAPD implementation. The QAPD establishes independence between the organization responsible for checking a function and the organization that performs the function. In addition, the QAPD allows TVA management to size the QA organization commensurate with the duties and responsibilities assigned.*
>
> *In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Basic Requirement 1 and Supplement 1S-1.*

In RAI 17.5-5, dated December 31, 2008, the NRC staff requested that the applicant provide a description of managerial and administrative controls with respect to operations, including the functions of positions referred to in Section 1, Section 2.6, and Section 2.7, respectively.

In its letter dated February 2, 2009, and supplementary letter dated February 25, 2010, the applicant proposed a detailed description of the construction, preoperational/testing, and operations organizations and stated that conforming changes to the VCSNS QAPD will be made consistent with NEI 06-14A, Revision 7. Additionally, in a letter dated, May 24, 2010, the applicant provided a markup of the VCSNS QAPD, Revision 2 in which the applicant proposed a new "New Nuclear Deployment," organization chart separate from construction organization; proposed additional detail description for the roles and responsibilities of the Engineering, Procurement, and Construction (EPC) contractor in Part 1, Section 1.6 of the VCSNS QAPD; and to incorporate NEI 06-14, Revision 7 updates. The NRC staff has reviewed the markup of the VCSNS QAPD, Revision 2, and determined that the proposed changes have been incorporated in Section 1 and Section 2 of the VCSNS QAPD. The NRC staff has also verified that SCE&G has proposed changes to the VCSNS QAPD, which incorporates all of the revisions in NEI 06-14A, Revision 7, as approved by the NRC staff. These items are identified as **Confirmatory Item VCSNS 17.5-2**, pending formal revision of the VCSNS QAPD.

Resolution of Confirmatory Item VCSNS 17.5-2

Confirmatory Item VCSNS 17.5-2 is an applicant commitment to revise its QAPD. The staff verified that the VCSNS COL application was appropriately updated. As a result, Confirmatory Item VCSNS 17.5-2 is now closed.

17.5.4.2 *Quality Assurance Program*

The following portion of this technical evaluation section is reproduced from Section 17.5.4.2 of the VEGP SER:

> *TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.B. The QAPD establishes measures to implement a QA program to ensure that the design, construction, and operation of a nuclear power plant are*

in accordance with governing regulations and license requirements. The QA program comprises those planned and systematic actions necessary to provide confidence that SSCs will perform their intended safety function, including certain non-safety-related SSCs and activities that are significant contributors to plant safety, as described in the applicant's FSAR. The QA program requires that a list or system identifying SSCs and activities to which the QAPD applies be maintained.

The QAPD provides measures to assess the adequacy of the QAPD and to ensure its effective implementation at least once each year or at least once during the life of the activity, whichever is shorter. The program allows the period for assessing the QAPD during the operations phase to be extended to once every 2 years. In addition, consistent with Section 17.5 of NUREG-0800, paragraph II.B.8, the QAPD applies a grace period of 90 days to activities that must be performed on a periodic basis. The next due date for the performance of an activity that invokes the 90-day grace period remains unchanged. The next due date for an activity performed before the scheduled due date is moved backwards so that the interval prescribed for the performance of the activity is not exceeded.

The QAPD also follows the guidance of Section 17.5 of NUREG-0800, paragraphs II.S and II.T. The QAPD describes measures to establish and maintain formal indoctrination and training programs for personnel performing, verifying, or maintaining activities within the scope of the QAPD to ensure that they achieve and maintain suitable proficiency. The plant's technical specifications delineate the minimum qualifications for plant and support staff. Personnel are required to complete the training for positions identified in 10 CFR 50.120, "Training and Qualification of Nuclear Power Plant Personnel," according to programs accredited by the National Nuclear Accrediting Board of the National Academy for Nuclear Training. The QAPD also provides the minimum training requirements for managers responsible for QAPD implementation, in addition to the minimum training requirements for the individuals responsible for planning, implementing, and maintaining the QAPD.

The QAPD also follows Section 17.5 of NUREG-0800, paragraph II.W. The QAPD provides measures for establishing an independent review program for activities occurring during the operational phase. In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Basic Requirement 2 and Supplements 2S-1, 2S-2, 2S-3, and 2S-4, with the following alternatives:

- *NQA-1-1994, Supplement 2S-1, includes NQA-1-1994, Appendix 2A-1.The QAPD proposes the following alternatives to the implementation of Supplement 2S-1 and Appendix 2A-1:*

  – *NQA-1-1994, Supplement 2S-1, states that the organization designate those activities that require qualified inspectors and test personnel and establish written procedures for the qualification of these personnel. As an alternative to this requirement, the QAPD proposes that a qualified engineer may plan inspections, evaluate the capabilities of an inspector, or evaluate the training program for*

inspectors. For the purposes of these functions, a qualified engineer is one who has a baccalaureate degree in engineering in a discipline related to the inspection or test activity (i.e., electrical, mechanical, or civil engineering) and has at least 5 years of engineering work experience, with at least 2 years of this experience regarding nuclear facilities. The NRC staff evaluated this proposed alternative and determined that the designation of a qualified engineer to plan inspections, evaluate inspectors, or evaluate the inspector qualification programs is consistent with the training and qualification criteria of 10 CFR Part 50, Appendix B, Criterion II, "Quality Assurance Program," and NQA-1-1994, Supplement 2S-1. Therefore, the NRC staff concluded that this alternative is acceptable.

– *NQA-1-1994, Appendix 2A-1 provides guidance for qualifying inspection and test personnel as Level I, II, or III. As an alternative to this guidance, the QAPD proposes that personnel performing independent quality verification inspections, examinations, measurements, or tests will be required to possess qualifications equal to or better than those required for performing the task being verified. In addition, the verification performed must be within the skills of these personnel and addressed by procedures. These personnel will not be responsible for planning quality verification inspections or tests (i.e., establishing hold points and acceptance criteria in procedures, and determining responsibility for performing the inspection), evaluating inspection training programs, or certifying inspection personnel. The NRC staff evaluated this proposed alternative and determined that it is consistent with inspection and test personnel initial qualification requirements specified in Section 17.5 of NUREG-0800, paragraph II.T.5. Therefore, the NRC staff concluded that this alternative is acceptable.*

- *NQA-1-1994, Supplement 2S-2, states that nondestructive examination personnel must be qualified. As an alternative to this requirement, the QAPD proposes to follow the applicable standard cited in Sections III and XI of the ASME Boiler and Pressure Vessel Code. 10 CFR 50.55a, "Codes and Standards," also requires the use of the latest Edition and Addenda of Sections III and XI of the ASME Code. The NRC staff evaluated this proposed alternative and determined that it is consistent with the regulation in 10 CFR 50, Appendix B, Criterion II, "Quality Assurance Program." Therefore, the NRC staff concluded that this alternative is acceptable.*

- *NQA-1-1994, Supplement 2S-3, states that the prospective lead auditors must have participated in a minimum of five audits in the previous 3 years. As an alternative to this requirement, the QAPD proposes to follow the guidance provided in Section 17.5 of NUREG-0800, paragraph II.S.4.c, which states that prospective lead auditors shall demonstrate their ability to properly conduct the audit process, as implemented by the company, to effectively lead an audit team, and to effectively organize and report results, including participation in at least one nuclear audit within the year preceding the date of qualification. The*

NRC staff evaluated this proposed alternative and determined that it is consistent with the regulation in 10 CFR Part 50, Appendix B, Criterion II. Therefore, the NRC staff concluded that this alternative is acceptable.

The following portion of this technical evaluation section is reproduced from Section 17.5.4.2 of the VEGP SER:

In RAI 17.5-5, dated May 12, 2008, the NRC staff requested that the applicant revise the TVA QAPD Part II, Section 2.5 to cite the correct regulation of 10 CFR 52.79(a)(27) versus 10 CFR 50.34(b)(6)(ii). In its response dated June 26, 2008, the applicant proposed to revise the TVA QAPD Part II, Section 2.5 consistent with the proposed wording in NEI Technical Report 06-14A, "Quality Assurance Program Description," Revision 5, dated May 2008. Revision 5 of NEI 06-14A has not been approved by the NRC staff; therefore, this issue will remain open until Revision 5 of NEI 06-14A is approved and TVA has incorporated the approved changes into the TVA QAPD. This is identified as ***Open Item 17.5-1****.*

Resolution of Standard Content Open Item 17.5-1

Revision 7 of NEI 06-14A was approved by the NRC staff in a letter dated November 3, 2009, and adequately addressed RAI 17-5-5. In a letter dated December 31, 2009, the VEGP applicant provided a markup of Revision 9 of the SNC QAPD. The NRC staff has reviewed the markup of SNC QAPD, Revision 9, and determined that conforming changes have been proposed to Section 2.5 consistent with NEI 06-14A, Revision 7. On this basis, Open Item 17.5-1 is ***Confirmatory Item 17.5-7*** *for the VEGP COL application.*

In Revision 1 of the VCSNS COL application, which included Revision 1 of the QAPD, the applicant addressed the information related to citation of correct regulations. Specifically, the NRC staff has confirmed through review of the Revision 1 of the VCSNS QAPD that the applicant has incorporated the applicable changes in Section 2.5 of the QAPD, and is consistent with NEI 06-14A, Revision 7; therefore, Confirmatory Item 17.5-7 is resolved for VCSNS COL application.

The following portion of this technical evaluation section is reproduced from Section 17.5.4.2 of the VEGP SER:

In RAI 17.5-6, the NRC staff requested that the applicant explain how the discussion of the Independent Review Committee responsibilities in Part II, Section 2.7 of the TVA QAPD is consistent with the requirements of American National Standards Institute (ANSI) N18.7. In its response dated June 26, 2008, the applicant proposed to revise the TVA QAPD Part II, Section 2.7 consistent with the proposed wording in NEI 06-14A, Revision 5. This issue will remain open until Revision 5 of NEI 06-14A is approved and TVA has incorporated the approved changes into the TVA QAPD. This is identified as ***Open Item 17.5-2****.*

Resolution of Standard Content Open Item 17.5-2

NEI 06-14A, Revision 7, adequately addressed RAI 17.5-6. In a letter dated December 31, 2009, the applicant provided a markup of Revision 9 of the SNC

QAPD. The NRC staff has reviewed the markup of SNC QAPD, Revision 9, and determined that conforming changes have been proposed to Section 2.7 consistent with NEI 06-14A, Revision 7. On this basis, Open Item 17.5-2 is ***Confirmatory Item 17.5-8*** *for the VEGP COL application.*

Resolution of Standard Content Confirmatory Item 17.5-8

Confirmatory Item 17.5-8 is an applicant commitment to revise its QAPD. The staff verified that the VEGP COL application was appropriately updated. As a result, Confirmatory Item 17.5-8 is now closed.

The following portion of this technical evaluation section is reproduced from Section 17.5.4 of the VEGP SER:

Design Control

The following portion of this technical evaluation section is reproduced from Section 17.5.4.3 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.C. The QAPD establishes the necessary measures to control the design, design changes, and temporary modifications (e.g., temporary bypass lines, electrical jumpers and lifted wires, and temporary setpoints) of items that are subject to the provisions of the QAPD. The QAPD design process includes provisions to control design inputs, outputs, changes, interfaces, records, and organizational interfaces with the applicant and its suppliers. These provisions ensure that the design inputs (i.e., design bases and the performance, regulatory, quality, and quality verification requirements) are correctly translated into design outputs (i.e., analyses, specifications, drawings, procedures, and instructions). In addition, the QAPD provides for individuals knowledgeable in QA principles to review design documents to ensure that they contain the necessary QA requirements.

In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Basic Requirement 3 and Supplement 3S-1, to establish the program for design control and verification, Subpart 2.20 for the subsurface investigation requirements, and Subpart 2.7 for the standards for computer software QA controls.

Procurement Document Control

The following portion of this technical evaluation section is reproduced from Section 17.5.4.4 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.D. The QAPD establishes the necessary administrative controls and processes to ensure that procurement documents include or reference applicable regulatory, technical, and QA program requirements. As noted in Section 17.5 of NUREG-0800, paragraph II.D.1, applicable technical, regulatory, administrative, quality, and reporting requirements (such as specifications, codes, standards, tests, inspections, special processes, and the regulation in

10 CFR Part 21, "Reporting of Defects and Noncompliance") are invoked for procurement of items and services.

In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Basic Requirement 4 and Supplement 4S-1, with the following alternatives and commitment:

- *NQA-1-1994, Supplement 4S-1, Section 2.3, states that procurement documents must require suppliers to have a documented QA program that implements NQA-1-1994, Part I.*

  – *As an alternative to this requirement, the QAPD proposes that suppliers have a documented QA program that meets Appendix B to 10 CFR Part 50, as applicable to the circumstances of the procurement. The NRC staff evaluated this proposed alternative and determined that it is consistent with Appendix B, Criterion IV, "Procurement Document Control." Therefore, the NRC staff concluded that this alternative is acceptable.*

  – *As an alternative to this requirement, the QAPD proposes that procurement documents allow suppliers to work under TVA's QAPD, including implementing procedures, if suppliers do not have their own QA program. The NRC staff evaluated this proposed alternative and determined that TVA's QAPD follows the guidance in Section 17.5 of NUREG-0800, paragraph II.G, regarding "Control of Purchased Material, Equipment, and Services." Specifically, the QAPD provides measures to evaluate prospective suppliers so that only qualified suppliers are selected, acceptance actions are performed for procured products and services, and suppliers are periodically audited and evaluated to ensure that qualified suppliers continue to provide acceptable products and services. Therefore, the NRC staff concluded that this alternative is acceptable.*

- *NQA-1-1994, Supplement 4S-1, Section 3, states that procurement documents are to be reviewed before award of the contract. As an alternative to this requirement, the QAPD proposes to conduct the QA review of procurement documents through review of the applicable procurement specification, including the technical and quality procurement requirements, before contract award. In addition, procurement document changes (e.g., scope, technical, or quality requirements) will also receive QA review. The NRC staff evaluated this proposed alternative and determined that it provides adequate QA review of procurement documents before awarding the contract and after any change. Therefore, the NRC staff concluded that this alternative is acceptable.*

- *In the QAPD, TVA commits that procurement documents prepared for commercial-grade items, procured as safety-related items, shall contain technical and quality requirements such that the procured item can be appropriately dedicated. The NRC staff evaluated this proposed commitment and determined that it is consistent with NRC staff guidance*

in Generic Letter (GL) 89-02, "Actions to Improve the Detection of Counterfeit and Fraudulently Marked Products," dated March 21, 1989, and GL 91-05, "Licensee Commercial-Grade Procurement and Dedication Programs," dated April 9, 1991, as delineated in Section 17.5 of NUREG-0800, paragraphs II.U.1.d and II.U.1.e.Therefore, the NRC staff concluded that this commitment is acceptable.

In RAI 17.5-7, dated May 12, 2008, the NRC staff requested that the applicant revise TVA QAPD Part II, Section 4 to substitute "TVA's" for "licensee's" to make it clear that a supplier may work under TVA's approved QA program. In its response dated June 26, 2008, the applicant stated that current use of "licensee's" is consistent with the wording in NEI 06-14A, Revision 4, which has been approved by the NRC staff. In a letter, dated September 17, 2008, the NRC staff requested NEI to address this question as part of a future revision to NEI 06-14A. This issue will remain open until Revision 5 of NEI 06-14A is approved and TVA has incorporated the approved changes into the TVA QAPD. This is identified as ***Open Item 17.5-3****.*

Resolution of Standard Content Open Item 17.5-3

NEI 06-14A, Revision 7, adequately addressed RAI 17.5-7. In a letter dated December 31, 2009, the applicant provided a markup of Revision 9 of the SNC QAPD. The NRC staff has reviewed the markup of SNC QAPD, Revision 9, and determined that conforming changes have been proposed to Section 4 consistent with NEI 06-14A, Revision 7. On this basis, Open Item 17.5-3 is ***Confirmatory Item 17.5-9*** *for the VEGP COL application.*

Resolution of Standard Content Confirmatory Item 17.5-9

Confirmatory Item 17.5-9 is an applicant commitment to revise its QAPD. The staff verified that the VEGP COL application was appropriately updated. As a result, Confirmatory Item 17.5-9 is now closed.

Instructions, Procedures, and Drawings

The following portion of this technical evaluation section is reproduced from Section 17.5.4.5 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.E. The QAPD establishes the necessary measures and governing procedures to ensure that activities affecting quality are prescribed by and performed in accordance with documented instructions, procedures, and drawings.

In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Basic Requirement 5, to establish procedural controls.

Document Control

The following portion of this technical evaluation section is reproduced from Section 17.5.4.6 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.F. The QAPD establishes the necessary measures and governing procedures to control the preparation, review, approval, issuance, and changes of documents that specify quality requirements or prescribe measures for controlling activities affecting quality, including organizational interfaces. The QAPD provides measures to ensure that the same organization that performed the original review and approval also review and approve revisions or changes to documents, unless other organizations are specifically designated.

A listing of all controlled documents identifying the current approved revision or date is maintained so personnel can readily determine the appropriate document for use. To ensure effective and accurate procedures during the operational phase, applicable procedures are reviewed and updated as necessary, consistent with NRC staff guidance provided in Section 17.5 of NUREG-0800, paragraph II.F.8.

In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Basic Requirement 6 and Supplement 6S-1, to establish provisions for document control.

Control of Purchased Material, Equipment, and Services

The following portion of this technical evaluation section is reproduced from Section 17.5.4.7 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.G. The QAPD establishes the necessary measures and governing procedures to control the procurement of items and services to ensure conformance with specified requirements. The program provides measures to evaluate prospective suppliers so that only qualified suppliers are selected. In addition, the program requires that suppliers be periodically audited and evaluated to ensure that qualified suppliers continue to provide acceptable products and services.

The program provides for acceptance actions, such as source verification, receipt inspection, pre- and post-installation tests, and review of documentation, such as certificates of conformance, to ensure that procurement, inspection, and test requirements have been satisfied before relying on the item to perform its intended safety function. Purchased items (such as components, spares, and replacement parts necessary for plant operation, refueling, maintenance, and modifications) and services are subject to quality and technical requirements at least equivalent to those specified for original equipment or by properly reviewed and approved revisions to ensure that the items are suitable for the intended service and are of acceptable quality, consistent with their effect on safety.

In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Basic Requirement 7 and Supplement 7S-1, to establish procurement verification control, with the following exceptions and alternatives:

- *NQA-1-1994, Basic Requirement 7 and Supplement 7S-1, state that procurement sources and suppliers' performance are to be evaluated. As an exception to these requirements, the QAPD proposes that other 10 CFR Part 50 licensees (other than TVA), authorized nuclear inspection agencies, the National Institute of Standards and Technology (NIST), and other State and Federal agencies that may provide items or services to TVA are not required to be evaluated or audited.*

  The NRC staff acknowledges that 10 CFR Part 50 licensees, authorized nuclear inspection agencies, the National Voluntary Laboratory Accreditation Program (NVLAP) administered by NIST, and other state and federal agencies perform work under quality programs acceptable to the NRC, and that no additional audits or evaluations are required. However, TVA remains responsible for ensuring that procured items or services conform to its Appendix B program, applicable ASME Boiler and Pressure Vessel Code requirements, and other regulatory requirements and commitments. TVA also remains responsible for ensuring that the items or services are suitable for the intended application and for documenting the evaluation that supports this conclusion. The proposed exception provides an appropriate level of quality and safety. The NRC staff determined that this exception is acceptable as documented in a previous SE.

- *Section 17.5 of NUREG-0800, paragraph II.L.8, establishes provisions for the procurement of commercial-grade calibration services for safety-related applications. As an exception to these provisions, the QAPD proposes that procurement source evaluation and selection measures not be required, provided all of the following conditions are met:*

  - *Purchase documents impose additional technical and administrative requirements to satisfy any licensee-specific QAPD and technical requirements.*

  - *Purchase documents require reporting as-found calibration data when calibrated items are found to be out of tolerance.*

- *A documented review of the supplier's accreditation will be performed and will include a verification of the following:*

    - *The calibration laboratory holds a domestic accreditation by any one of the following accrediting bodies, which are recognized by the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA):*

        - *National Voluntary Laboratory Accreditation Program (NVLAP), administered by the National Institute of Standards & Technology,*

        - *American Association for Laboratory Accreditation (A2LA).*

    - *The accreditation encompasses ANS/ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories."*

    - *The published scope of accreditation for the calibration laboratory covers the necessary measurement parameters, range, and uncertainties.*

The NRC staff evaluated and found to be acceptable the NVLAP and A2LA accreditation programs. In RAI 17.5-13, dated May 12, 2008, the NRC staff requested that the applicant justify the wording discrepancy between TVA QAPD Part II, Section 7.2 and Section 17.5 of NUREG-0800, Section II.L.8.c, regarding the NRC approved alternative for commercial grade calibration services. In its response dated June 24, 2008, the applicant stated that wording is consistent with the wording in NEI 06-14A, Revision 4, which has been approved by the NRC staff. In a letter, dated September 17, 2008, the NRC staff requested NEI to address this question as part of Revision 5 to NEI 06-14A. This issue will remain open until Revision 5 of NEI 06-14A is approved and TVA has incorporated the approved changes into the TVA QAPD. This is identified as ***Open Item 17.5-4****.*

Resolution of Standard Content Open Item 17.5-4

NEI 06-14A, Revision 7, adequately addressed RAI 17.5-13. In a letter dated December 31, 2009, the VEGP applicant provided a markup of Revision 9 of the SNC QAPD. The NRC staff has reviewed the markup of SNC QAPD, Revision 9, and determined that conforming changes have been proposed to Section 7.2 consistent with NEI 06-14A, Revision 7. On this basis, Open Item 17.5-4 is ***Confirmatory Item 17.5-10*** *for the VEGP COL application.*

Resolution of Standard Content Confirmatory Item 17.5-10

Confirmatory Item 17.5-10 is an applicant commitment to revise its QAPD. The staff verified that the VEGP COL application was appropriately updated. As a result, Confirmatory Item 17.5-10 is now closed.

The following portion of this technical evaluation section is reproduced from Section 17.5.4.7 of the BLN SER:

- *NQA-1-1994, Supplement 7S-1, Section 8.1, states that documentary evidence that items conform to procurement documents shall be available at the nuclear facility site prior to installation or use. As an alternative to the requirement for procurement documentary evidence to be available at the nuclear facility site during construction. The QAPD proposes that documentary evidence may be stored in physical form or in electronic media, under the control of TVA or its supplier(s), at a location(s) other than the nuclear facility site, as long as the documents can be accessed at the nuclear facility site during construction. After completion of construction, TVA will have sufficient documentary evidence to support operations. The NRC staff determined that implementation of this alternative would allow access to and review of the necessary procurement documentary evidence at the nuclear facility site, both before installation and use. Therefore, the NRC staff concluded that this alternative is acceptable.*

- *As an alternative to the requirements for the control of commercial-grade items and services in NQA-1-1994, Supplement 7S-1, Section 10, TVA commits in the QAPD to follow NRC guidance discussed in GL 89-02 and GL 91-05. In addition, TVA commits to establish and describe special quality verification requirements in applicable documents to assure that the commercially procured items will perform satisfactorily in service. In addition, the documents should provide for determining critical characteristics, technical evaluation, receipt requirements, and quality evaluation of the items to ensure that the items are suitable for their intended use. The NRC staff determined that this alternative will improve detection of counterfeit and fraudulently marked products and will improve the commercial-grade dedication programs. This alternative is consistent with the guidance of Section 17.5 of NUREG-0800, paragraphs II.U.1.d and II.U.1.e. Therefore, the NRC staff concluded that this alternative is acceptable.*

- *As an alternative to the requirements for the control of commercial-grade items and services in NQA-1-1994, Supplement 7S-1, Section 10, TVA commits to use other appropriate approved regulatory means and controls to support TVA commercial grade dedication activities. One example of this is NRC Regulatory Issue Summary (RIS) 2002-22, "Use of EPRI/NEI Joint Task Force Report, 'Guideline on Licensing Digital Upgrades: EPRI TR-102348, Revision 1, NEI 01-01: A Revision of EPRI TR-102348 to Reflect Changes to the 10 CFR 50.59 Rule.'" TVA will assume 10 CFR Part 21 reporting responsibility for all items that TVA dedicates as safety-related.*

In RAI 17.5-14, the NRC staff requested that the applicant provide an explanation as to how RIS 2002-22 represents an example of other approved regulatory means for commercial grade dedication activities. In its response dated June 24, 2008, the applicant stated that wording is consistent with the wording in NEI 06-14A, Revision 4, which has been approved by the NRC staff. In a letter, dated September 17, 2008, the NRC staff requested NEI to address this question as part of Revision 5 to NEI 06-14A. This issue will remain open until Revision 5

of NEI 06-14A is approved and TVA has incorporated the approved changes into the TVA QAPD. This is identified as ***Open Item 17.5-5****.*

Resolution of Standard Content Open Item 17.5-5

NEI 06-14A, Revision 7, adequately addressed RAI 17.5-14. In a letter dated December 31, 2009, the VEGP applicant provided a markup of Revision 9 of the SNC QAPD. The NRC staff has reviewed the markup of SNC QAPD, Revision 9, and determined that conforming changes have been proposed to Section 7.2 consistent with NEI 06-14A, Revision 7. On this basis, Open Item 17.5-5 is ***Confirmatory Item 17.5-11*** *for the VEGP COL application.*

Resolution of Standard Content Confirmatory Item 17.5-11

Confirmatory Item 17.5-11 is an applicant commitment to revise its QAPD. The staff verified that the VEGP COL application was appropriately updated. As a result, Confirmatory Item 17.5-11 is now closed.

Identification and Control of Materials, Parts, and Components

The following portion of this technical evaluation section is reproduced from Section 17.5.4.8 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.H. The QAPD establishes the necessary measures for the identification and control of items such as materials, including consumables and items with limited shelf life, parts, components, and partially fabricated subassemblies. The identification of items is maintained throughout fabrication, erection, installation, and use so that the item can be traced to its documentation, consistent with the item's effect on safety.

In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Basic Requirement 8 and Supplement 8S-1, to establish provisions for identification and control of items.

Control of Special Processes

The following portion of this technical evaluation section is reproduced from Section 17.5.4.9 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.I. The QAPD establishes programs, procedures, and processes to ensure that special processes requiring interim process controls to ensure quality, such as welding, heat treating, chemical cleaning, and nondestructive examinations are implemented and controlled in accordance with applicable codes, specifications, and standards.

In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Basic Requirement 9 and Supplement 9S-1, to establish measures for the control of special processes.

Inspection

The following portion of this technical evaluation section is reproduced from Section 17.5.4.10 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.J. The QAPD establishes the necessary measures to implement inspections that ensure items, services, and activities affecting safety meet established requirements and conform to applicable documented specifications, instructions, procedures, and design documents. The inspection program establishes requirements for planning inspections, determining applicable acceptance criteria, setting the frequency of inspection, and identifying special tools needed to perform the inspection. Properly qualified personnel independent of those who performed or directly supervised the work are required to perform the inspections.

In the QAPD, TVA commits to comply with NQA-1-1994, Basic Requirement 10, Supplement 10S-1, and Subparts 2.4, 2.5, and 2.8, to establish inspection requirements, with the following commitment and alternative:

- *NQA-1-1994, Subpart 2.4, requires the use of the Institute of Electrical and Electronic Engineers (IEEE) Standard 336-1985, "IEEE Standard Installation, Inspection, and Testing Requirements for Power, Instrumentation, and Control Equipment at Nuclear Facilities." IEEE Standard 336-1985 refers to IEEE 498-1985, "IEEE Standard Requirements for the Calibration and Control of Measuring and Test Equipment Used in Nuclear Facilities." Each of these standards uses the definition of safety systems equipment from IEEE Standard 603-1980, "IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations." IEEE Standard 603-1980 defines "safety system" as:*

  > *Those systems (the reactor trip system, an engineered safety feature, or both, including all their auxiliary supporting features and other auxiliary feature) which provide a safety function. A safety system is comprised of more than one safety group of which any one safety group can provide the safety function.*

  The QAPD must commit to the definition of safety systems equipment from IEEE Standard 603-1980 to appropriately implement NQA-1-1994, Subpart 2.4. In the QAPD, TVA commits to the definition of safety systems equipment from IEEE Standard 603-1980, but does not commit to the balance of IEEE Standard 603-1980. This definition applies only to equipment in the context of Subpart 2.4. The NRC staff determined that the use of the definition of safety systems equipment is acceptable because it is consistent with the requirements of NQA-1-1994, Subpart 2.4.

- *NQA-1-1994, Supplement 10S-1, Section 3.1, states that inspection personnel shall not report to the immediate supervisor who is responsible for performing the work being inspected. As an alternative to this*

requirement, the QAPD proposes that QA inspectors will report to quality control management while performing such inspections. The NRC staff determined that the use of this alternative is consistent with guidance provided in Section 17.5 of NUREG-0800, paragraph II.J.1. Therefore, the NRC staff concluded that this alternative is acceptable.

In a letter dated December 31, 2009, the VEGP applicant provided a markup of Revision 9 of the SNC QAPD that includes the alternative to NQA-1-1994, Supplement 10S-1, Section 3.1, discussed above. The NRC staff has reviewed the markup of SNC QAPD, Revision 9, and determined that the proposed changes are consistent with the alternative evaluated in the BLN SER. These items are identified as ***Confirmatory Item 17.5-12****, pending NRC review of the revised QAPD as referenced in Section 17.5 of the VEGP COL FSAR.*

Resolution of Standard Content Confirmatory Item 17.5-12

Confirmatory Item 17.5-12 is an applicant commitment to revise its QAPD. The staff verified that the VEGP COL application was appropriately updated. As a result, Confirmatory Item 17.5-12 is now closed.

The following portion of this technical evaluation section is reproduced from Section 17.5.4 of the VEGP SER:

Test Control

The following portion of this technical evaluation section is reproduced from Section 17.5.4.11 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.K. The QAPD establishes the necessary measures and governing provisions to demonstrate that items subject to the provisions of the QAPD will perform satisfactorily in service, that the plant can be operated safely as designed, and that the operation of the plant, as a whole, is satisfactory.

In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Basic Requirement 11 and Supplement 11S-1, to establish provisions for testing.

In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Supplement 11S-2 and Subpart 2.7, to establish provisions to ensure that computer software used in applications affecting safety be prepared, documented, verified, tested, and used such that the expected outputs are obtained and configuration control maintained.

Control of Measuring and Test Equipment

The following portion of this technical evaluation section is reproduced from Section 17.5.4.12 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.L. The QAPD establishes the necessary measures to control the

calibration, maintenance, and use of measuring and test equipment that provide information important to safe plant operation.

In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Basic Requirement 12 and Supplement 12S-1, to establish provisions for control of measuring and test equipment, with the following clarification and exception:

- *The QAPD clarifies that the out-of-calibration conditions, described in paragraph 3.2 of Supplement 12S-1 of NQA-1-1994, refer to cases where the measuring and test equipment are found to be out of the required accuracy limits (i.e., out of tolerance) during calibration. The NRC staff determined that the clarification for the out-of-calibration conditions is consistent with Supplement 12S-1. Therefore, the NRC staff concluded that this clarification is acceptable.*

- *As an alternative to the NQA-1-1994, Subpart 2.4, Section 7.2.1, calibration labeling requirements, the QAPD proposes that, when it is impossible or impractical to mark equipment with required calibration information because of equipment size or configuration, the required calibration information will be documented and traceable to the equipment. The NRC staff determined that this alternative is consistent with NRC staff guidance provided in Section 17.5 of NUREG-0800, paragraph II.L.3. Therefore, the NRC staff concluded that this alternative is acceptable.*

Handling, Storage, and Shipping

The following portion of this technical evaluation section is reproduced from Section 17.5.4.13 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.M. The QAPD establishes the necessary measures to control the handling, storage, packaging, shipping, cleaning, and preservation of items to prevent inadvertent damage or loss and to minimize deterioration.

In the QAPD, TVA commits to comply with NQA-1-1994, Basic Requirement 13 and Supplement 13S-1, and to establish provisions for handling, storage, and shipping. In the QAPD, TVA also commits to comply with NQA-1-1994, Subparts 2.1 and 2.2 during the construction and pre-operations phase of the plant, as applicable, with the following alternative:

- *NQA-1-1994, Subpart 2.2, Section 6.6, states that the preparation of records must include information on personnel access to QA records. The QAPD establishes the necessary measures to document personnel authorized to access storage areas and recording personnel access. However, the QAPD proposes to not consider these documents as quality records. As an alternative, SNC will retain these documents in accordance with plant administrative controls. The NRC staff determined that these records do not meet the classification of a quality record as*

defined in NQA-1-1994, Supplement 17S-1, Section 2.7. Therefore, the NRC staff concluded that this alternative is acceptable.

- *NQA-1-1994, Subpart 2.2, Section 7.1, refers to Subpart 2.15 for requirements related to handling of items. The QAPD clarifies that the scope of Subpart 2.15 includes hoisting, rigging and transporting of items for nuclear power plants during construction. The NRC staff has determined that this clarification is acceptable because it distinguishes between the requirements for construction and operation.*

NQA-1-1994, Subpart 3.2, Appendix 2.1, Section 3, provides cleaning recommendations and precautions. In RAI 17.5-8, dated January 26, 2008, the NRC staff requested that the applicant provide justification for taking exception to RG 1.37, "Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components of Water-Cooled Nuclear Power Plants," Regulatory Position C.3, and clarify the revision of RG 1.37 to which it is committed. In a letter dated February 13, 2009, the VCSNS applicant clarified that the VCSNS QAPD was developed utilizing Revision 5, of NEI 06-14A, which does not take any exception to RG 1.37, and is committed to RG 1.37, Revision 1, for programmatic and/or operational aspects. Further, the applicant stated that future revisions of VCSNS COL application will incorporate the appropriate approved versions of NEI 06-14A with no deviations in this subsection. The NRC staff reviewed the applicant's response and has determined that this clarification is acceptable, because commitment to NQA-1-1994, Subpart 3.2, Appendix 2.1, Section 3 is consistent with Regulatory Position C 3 of RG 1.37. The NRC staff has also verified the subject text is consistent with NEI 06-14A, Revision 7; therefore, RAI 17.5-8 is closed.

The following portion of this technical evaluation section is reproduced from Section 17.5.4 of the VEGP SER:

Inspection, Test, and Operating Status

The following portion of this technical evaluation section is reproduced from Section 17.5.4.14 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.N. The QAPD establishes the necessary measures to identify the inspection, test, and operating status of items and components subject to the provisions of the QAPD to maintain personnel and reactor safety and avoid inadvertent operation of equipment.

In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Basic Requirement 14, for identifying inspection, test, and operating status.

Nonconforming Materials, Parts, or Components

The following portion of this technical evaluation section is reproduced from Section 17.5.4.15 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.O. The QAPD establishes the necessary measures to control items, including services that do not conform to specified requirements to prevent

inadvertent installation or use. Nonconformances are evaluated for their impact on operability of quality SSCs to ensure that the final condition does not adversely affect safety, operation, or maintenance of the item or service. The results of evaluations of conditions adverse to quality are analyzed to identify quality trends, documented, and reported to upper management in accordance with applicable procedures.

In addition, the QAPD provides for establishing the necessary measures to implement the requirements of Subparts A and C of 10 CFR Part 52, 10 CFR 50.55(e), and 10 CFR Part 21, as applicable.

In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Basic Requirement 15 and Supplement 15S-1, to establish measures for nonconforming material.

Corrective Action

The following portion of this technical evaluation section is reproduced from Section 17.5.4.16 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.P. The QAPD establishes the necessary measures to promptly identify, control, document, classify, and correct conditions adverse to quality. The QAPD requires personnel to identify known conditions adverse to quality. Reports of conditions adverse to quality are analyzed to identify trends. Significant conditions adverse to quality are documented and reported to responsible management. In the case of suppliers working on safety-related activities or similar situations, TVA may delegate specific responsibility for the corrective action program, but TVA maintains responsibility for the program's effectiveness.

In addition, the QAPD provides for establishing the necessary measures to implement a reporting program in accordance with the requirements of 10 CFR Part 21.

In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Basic Requirement 16, to establish a corrective action program.

Quality Assurance Records

The following portion of this technical evaluation section is reproduced from Section 17.5.4.17 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.Q. The QAPD establishes the necessary measures to ensure that sufficient records of items and activities affecting quality are generated, identified, retained, maintained, and retrievable.

Concerning the use of electronic records storage and retrieval systems, the QAPD complies with the NRC guidance given in RIS 2000-18, "Guidance on Managing Quality Assurance Records in Electronic Media," dated

October 23, 2000, and associated Nuclear Information and Records Management Association (NIRMA) guidelines TG 11-1998, TG 15-1998, TG 16-1998 and TG 21-1998.

In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Basic Requirement 17 and Supplement 17S-1, to establish provisions for records, with the following alternative:

- *NQA-1-1994, Supplement 17S-1, Section 4.2(b) states that records must be firmly attached in binders or placed in folders or envelopes for storage in steel file cabinets or on shelving in containers. As an alternative to this requirement, the QAPD proposes that hard-copy records be stored in steel cabinets or on shelving in containers, except that methods other than binders, folders, or envelopes may be used to organize records for storage. The NRC staff determined that this alternative is acceptable as documented in an SER dated September 1, 2005 for Nuclear Management Company.*

<u>Quality Assurance Audits</u>

The following portion of this technical evaluation section is reproduced from Section 17.5.4.18 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.R. The QAPD establishes the necessary measures to implement audits to verify that activities covered by the QAPD are performed in conformance with documented requirements. The audit program is reviewed for effectiveness as part of the overall audit process.

The QAPD provides for the applicant or holder to conduct periodic internal and external audits. Internal audits are conducted to determine that the program and procedures being audited comply with the QAPD. Internal audits, conducted after placing the facility in operation, are performed with a frequency commensurate with safety significance and in such a manner as to ensure that an audit of all applicable QA program elements is completed for each functional area within a period of 2 years. External audits determine the adequacy of a supplier's or contractor's QA program.

TVA ensures that audits are documented and reviews audit results. TVA responds to all audit findings and initiates appropriate corrective actions. In addition, where corrective actions are indicated, TVA documents follow-up of applicable areas through inspections, review, re-audits, or other appropriate means to verify implementation of assigned corrective actions.

In the QAPD, TVA commits to comply with the quality standards described in NQA-1-1994, Basic Requirement 18 and Supplement 18S-1, to establish the independent audit program.

Nonsafety-Related SSCs Quality Assurance Control

Nonsafety-Related SSCs - Significant Contributors to Plant Safety

The following portion of this technical evaluation section is reproduced from Section 17.5.4.19.1 of the BLN SER:

TVA's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.V.1. The QAPD establishes program controls applied to non-safety-related SSCs that are significant contributors to plant safety and to which Appendix B does not apply. The QAPD applies specific controls to these items in a selected manner, targeting the characteristics or critical attributes that render the SSC a significant contributor to plant safety consistent with applicable sections of the QAPD.

In RAI 17.5-7, dated November 25, 2008, the NRC staff requested that the applicant provide additional description for SNC simultaneous and similar processes and the qualifications for personnel performing these inspections. In its response, dated December 17, 2008, the applicant stated that conforming changes to the SNC QAPD will be made consistent with NEI 06-14A after the revision has been formally approved by the NRC. In a letter dated December 31, 2009, the applicant proposed a markup of Revision 9 of the SNC QAPD. The NRC staff has verified that the SNC QAPD, Revision 9, markup has deleted the language. These items are identified as ***Confirmatory Item 17.5-14****, pending NRC review of the revised QAPD as referenced in Section 17.5 of the VEGP COL FSAR.*

Resolution of Standard Content Confirmatory Item 17.5-14

Confirmatory Item 17.5-14 is an applicant commitment to revise its QAPD. The staff verified that the VEGP COL application was appropriately updated. As a result, Confirmatory Item 17.5-14 is now closed.

17.5.4.19.2 Nonsafety-Related SSCs Credited for Regulatory Events

SCE&G's QAPD follows the guidance of Section 17.5 of NUREG-0800; paragraph II.V.2, to establish the quality requirements for nonsafety-related SSCs credited for regulatory events. In the QAPD, SCE&G commits to comply with the following regulatory guidance:

- SCE&G shall implement quality provisions for the fire protection system in accordance with Regulatory Position 1.7, "Quality Assurance," in RG 1.189, "Fire Protection for Operating Nuclear Power Plants," issued April 2001.

- SCE&G shall implement quality provisions for anticipated transient without scram (ATWS) equipment in accordance with Part III, Section 1 of the QAPD.

In RAI 17.5-2, the NRC staff requested that the applicant revise Appendix IAA of the VCSNS COL FSAR to address conformance with RG 1.155, "Station Blackout." In a letter dated February 2, 2009, the applicant proposed to revise Part III, Section 2, of the VCSNS QAPD by deleting the last paragraph, which provided a description of the applicant's commitment to implement QA requirements for station blackout (SBO) equipment in accordance with RG 1.155,

and replacing with a proposed description stating that RG 1.155 does not apply to the AP1000 design since no AC power is required to support the availability of safety-related functions. The NRC staff has verified that the proposed revision with respect to RG 1.155 not applicable to AP1000 design was incorporated in Revision 1 of the VCSNS QAPD. In a letter dated May 24, 2010, the applicant provided a markup of the VCSNS QAPD, Revision 2, incorporating all the revisions in NEI 06-14A, Revision 7. In the markup of the VCSNS QAPD, Revision 2, the applicant provides its commitment to implement QA requirements for SBO equipment in accordance with the requirements of Part III, Section 1 of the QAPD. The NRC staff has reviewed the markup of the VCSNS QAPD, Revision 2, and determined that the conforming changes proposed in Part III, Section 2 of the VCSNS QAPD are consistent with NEI 06-14A, Revision 7, therefore, the NRC staff finds this to be acceptable. This item is identified as **Confirmatory Item VCSNS 17.5-3**, pending formal revision of the VCSNS COL application.

Resolution of Confirmatory Item VCSNS 17.5-3

Confirmatory Item VCSNS 17.5-3 is an applicant commitment to revise its QAPD. The staff verified that the VCSNS COL application was appropriately updated. As a result, Confirmatory Item 17.5-3 is now closed.

17.5.4.20 ***Regulatory Commitments***

SCE&G's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.U. The QAPD establishes QA program commitments. In letters dated May 24, 2010, and June 1, 2010, the applicant provided a markup of the VCSNS QAPD, Revision 2, in which SCE&G commits to comply with the following NRC regulatory guides and other QA standards to supplement and support the QAPD:

- RG 1.8, "Qualification and Training of Personnel for Nuclear Power Plants," Revision 3.
- RG 1.26, "Quality Group Classification and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," Revision 4.
- RG 1.28, "Quality Assurance Program Requirements (Design and Construction)," Revision 3.
- RG 1.29, "Seismic Design Classification," Revision 4.
- RG 1.33, "Quality Assurance Program Requirements (Operations)," Revision 2.
- RG 1.37, "Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components for Water-Cooled Nuclear Power Plants," Revision 1.
- ASME NQA-1-1994, Parts I, II, and III.
- NIRMA technical guides, as described in Part II, Section 17 of the QAPD.

The following portion of this technical evaluation section is reproduced from Section 17.5.4.20 of the VEGP SER:

> *In RAI 17.5-15 dated May 12, 2008, the NRC staff requested that the applicant revise the TVA QAPD Part IV to commit to RG 1.37 Revision 1, "Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components of Water-Cooled Nuclear Power Plants," issued March 2007. In its response dated June 24, 2008, the applicant stated that Part IV of the TVA QAPD is consistent with Revision 4 of NEI 06-14A. In a letter, dated September 17, 2008, the NRC staff requested NEI to address this question as part of Revision 5 to NEI 06-14A. However, the applicant committed to RG 1.37, Revision 1, in Revision 1 of the BLN QAPD. RAI 17.5-15 is closed.*
>
> *In a letter dated December 31, 2009, the VEGP applicant provided a markup of Revision 9 of the SNC QAPD. The NRC staff has reviewed the markup of SNC QAPD, Revision 9, and determined that conforming changes have been proposed to Part IV consistent with NEI 06-14A, Revision 7. On this basis, the updating of the SNC QAPD for closure of standard content RAI 17.5-15 is* ***Confirmatory Item 17.5-16*** *for the VEGP COL application.*
>
> *Resolution of Standard Content Confirmatory Item 17.5-16*
>
> *Confirmatory Item 17.5-16 is an applicant commitment to revise its QAPD. The staff verified that the VEGP COL application was appropriately updated. As a result, Confirmatory Item 17.5-16 is now closed.*

The following portion of this technical evaluation section is reproduced from Section 17.5.4.20 of the VEGP SER:

> *The NRC staff also reviewed Appendix 1AA of the BLN COL FSAR, which lists BLN's conformance with NRC RGs and provides any exceptions to conformance with those RGs. In RAI 17.5-17, the NRC staff requested that the applicant explain how the QAPD provides an acceptable exception to the RGs described in Appendix 1AA. In its response (ML081780171), the applicant stated that Part IV of the TVA QAPD is consistent with Revision 4 of NEI 06-14A. Additionally, the applicant provided further information addressing these RGs in response to RAIs 17.5-15 and 17.5-17. The response to RAI 17.5-15 proposed revisions to Appendix 1AA and Parts II* and *IV of the QAPD, whereas the response to RAI 17.5-17 provided further justification. The applicant provided a response to RAI 1-5 in a letter dated August 19, 2008, to address the discrepancies between the revisions of the RGs addressed in Appendix 1AA and those addressed in Westinghouse DCD Appendix 1A. The information in this letter appears to have superseded the changes that were proposed and acceptable to the NRC staff in the applicant's June 24, 2008 letter, thereby reopening the issue identified in RAI 17.5-17. This is identified as* ***Open Item 17.5-6****.*
>
> *Resolution of Standard Content Open Item 17.5-6*
>
> *In a letter dated July 29, 2009, the VEGP applicant stated that the revisions to the COL application identified in the referenced TVA August 19, 2008, letter do supersede the changes identified in the referenced TVA June 24, 2008, letter, as*

shown in Revision 1 of the BLN COL application. In a letter dated December 31, 2009, the VEGP applicant proposed additional changes to FSAR Chapter 1, Appendix 1AA to address conformance to RG 1.33, Revision 2. The NRC staff has reviewed the proposed changes to VEGP COL FSAR Chapter 1, Appendix 1AA, and determined that the changes are responsive to RAI 17.5-17. On this basis, Open Item 17.5-6 is ***Confirmatory Item 17.5-17*** *for the VEGP COL application*.

Resolution of Standard Content Confirmatory Item 17.5-17

Confirmatory Item 17.5-17 is an applicant commitment to revise its FSAR Appendix 1AA. The staff verified that the VEGP COL FSAR was appropriately updated. As a result, Confirmatory Item 17.5-17 is now closed.

As discussed above, in its May 24, 2010 and June 1, 2010 letters, the VCSNS applicant committed to update its COL application to reflect conformance with RGs 1.8, 1.26, 1.28, 1.29, 1.33 and 1.37, QA standards such as ASME NQA-1-1994, Parts I, II, and III, and NIRMA technical guides. The NRC staff has reviewed the applicant's proposed commitment to update the COL application to reflect this QA guidance and determined conforming changes consistent with NEI 06-14A, Revision 7 and is, therefore, acceptable. The commitment to update the VCSNS COL application to reflect this QA guidance is identified as **Confirmatory Item VCSNS 17.5-4**.

Resolution of Confirmatory Item VSCNS 17.5-4

Confirmatory Item VCSNS 17.5-4 is an applicant commitment to revise the COL application. The staff verified that the VCSNS COL FSAR was appropriately updated. As a result, Confirmatory Item VCSNS 17.5-4 is now closed.

17.5.5 Post Combined License Activities

There are no post-COL activities related to this section.

17.5.6 Conclusion

The NRC staff used the requirements of 10 CFR Part 50, Appendix B and the guidance of Section 17.5 of NUREG-0800 as the basis for evaluating the acceptability of SCE&G's QAPD and concludes that:

- The QAPD provides adequate guidance for SCE&G to describe the authority and responsibility of management and supervisory personnel, performance/verification personnel, and self-assessment personnel.

- The QAPD provides adequate guidance for SCE&G to provide for organizations and persons to perform verification and self-assessment functions with the authority and independence to conduct their activities without undue influence from those directly responsible for costs and schedules.

- The QAPD provides adequate guidance for SCE&G to apply a QAPD to activities and items that are important to safety.

- The QAPD provides adequate guidance for SCE&G to establish controls that, when properly implemented, comply with 10 CFR Part 52, Appendix B to 10 CFR Part 50; 10 CFR Part 21; and 10 CFR 50.55(e), with the acceptance criteria associated with Section 17.5 of NUREG-0800, and with the commitments to applicable regulatory guidance.

The SCE&G QAPD addresses VCS COL 17.5-1, STD COL 17.5-2, STD COL 17.5-4, and STD COL 17.5-8.

Based on the information provided by the applicant, the staff concludes that Section 17.5 of the VCSNS COL FSAR and the SCE&G QAPD meet the requirements of Appendix B to 10 CFR Part 50; 10 CFR 52.79(a)(17); 10 CFR 52.79(a)(25); and 10 CFR 52.79(a)(27).

17.6 Maintenance Rule Program (Related to RG 1.206, Section C.III.1, Chapter 17, C.I.17.6, "Description of the Applicant's Program for Implementation of 10 CFR 50.65, The Maintenance Rule")

17.6.1 Introduction

This section addresses the program for MR implementation. It is based on the requirements of 10 CFR Part 52 and the guidance provided to the industry by the Nuclear Management and Resources Council (NUMARC) and its successor, the NEI. NUMARC 93-01, "Industry Guidance for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," is endorsed by the staff in RG 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Revision 2. Section 11.0 of NUMARC 93-01 was later revised; the revision, as modified by RG 1.182, "Assessing and Managing Risk Before Maintenance Activities at Nuclear Power Plants," is also endorsed by the staff. NEI 07-02A, "Generic FSAR Template Guidance for Maintenance Rule Program Description for Plants Licensed Under 10 CFR Part 52," provides a template for presenting this information that has also been endorsed by the staff in a letter to NEI, dated January 24, 2008.

17.6.2 Summary of Application

In Section 17.6 of the VCSNS COL FSAR, Revision 4, the applicant provided the following:

Supplemental Information

- STD SUP 17.6-1

The applicant provided additional information which incorporates, by reference, NEI 07-02A. The applicant also identified where operational programs are described in the VCSNS COL FSAR, including a description of and milestones for the MR program.

- STD SUP 17.6-2

The applicant provided additional information to incorporate condition monitoring of underground or inaccessible cables into the maintenance rule program.

License Condition

- Part 10, License Condition 6, "Operational Program Readiness"

This license condition states that the COL holder shall provide an operational program schedule to support NRC inspections.

17.6.3 Regulatory Basis

Commission regulations for the MR program include the requirements of 10 CFR 50.65 and 10 CFR 52.79(a)(15). The staff reviews this part of the application in accordance with Section 17.6 of NUREG-0800.

The regulatory basis of the information incorporated by reference is addressed in the FSER for topical report NEI 07-02A, transmitted to NEI in a letter from the NRC staff, dated January 24, 2008.

SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria [ITAAC]," identifies schedule requirements and proposes a license condition to be satisfied by COL holders.

17.6.4 Technical Evaluation

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 17.6.4 of the VEGP SER.

The NRC staff reviewed conformance of Section 17.6 of the BLN COL FSAR, including the COL standard information item identified in Subsection 17.6.2, with the guidance in NUREG-0800, Section 17.6. The staff also compared it with RG 1.206, Section C.III.1, Chapter 17, C.I.17.6, "Description of the Applicant's Program for Implementation of 10 CFR 50.65, the Maintenance Rule."

In addition, the NRC staff reviewed the COL standard information item identified in Subsection 17.6.2 above. In its review, the staff used NUREG-0800, Section 17.6, "Maintenance Rule," as guidance.

Supplemental Information

- *STD SUP 17.6-1, which incorporated NEI 07-02A and identified where operational programs are described in the BLN COL FSAR, including a description of the MR program*

The applicant added the following text to Section 17.6 of the BLN COL FSAR:

> *This section incorporates by reference NEI 07-02A, "Generic FSAR Template Guidance for Maintenance Rule Program Description for Plants Licensed under 10 CFR Part 52," with the following supplemental information. See Table 1.6-201.*
>
> *Table 13.4-201 provides milestones for maintenance rule [MR] program implementation.*

The applicant indicated where, in the BLN COL FSAR, the programs listed in Subsection 17.X.3 of NEI 07-02A are described:

- *MR program (Section 17.6)*
- *QA program (Section 17.5)*
- *inservice inspection program (Sections 5.2 and 6.6)*
- *inservice testing program (Section 3.9)*
- *technical specifications surveillance test program (Chapter 16)*

The NRC staff endorsed NEI 07-02A, stating that it provides an acceptable method:

- *for complying with the requirement in 10 CFR 52.79(a)(15) that FSARs contain a description of the program and its implementation*

- *for monitoring the effectiveness of maintenance to meet the requirements of Section 50.65*

- *for satisfying the acceptance criteria of NUREG-0800, Section 17.6*

Because STD SUP 17.6-1 incorporates NEI 07-02A by reference and identifies the relevant operational programs and milestones, the staff finds that the applicant has provided sufficient information to fully describe the maintenance rule program. This provides reasonable assurance that the program, when implemented, satisfies the requirements of 10 CFR 50.65.

- *STD SUP 17.6-2*

In response to RAI 8.2-14, the applicant incorporated cable monitoring into its maintenance rule program. The program will monitor the condition of inaccessible or underground cables, including all those that support SSCs within the scope of 10 CFR 50.65. The staff documented its evaluation of the cable monitoring program in SER Section 8.2.4.

License Condition

- *Part 10, License Condition 6*

The applicant proposed a license condition to provide a schedule to support NRC inspection of operational programs including the MR program. The proposed license condition is consistent with the policy established in SECY-05-0197 and is acceptable.

17.6.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff finds the following license condition acceptable:

- License Condition (17-1) – No later than 12 months after issuance of the COL, the licensee shall submit to the Director of the Office of New Reactors, a schedule that supports planning for and conduct of NRC inspections of the Maintenance Rule (MR) program. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the MR program has been fully implemented.

17.6.6 Conclusion

The NRC staff reviewed the application and confirmed that the applicant addressed the required information relating to the MR program. STD SUP 17.6-1 incorporated NEI 07-02A by reference; identified where operational programs are described in the VCSNS COL FSAR, including a description of the MR program; and provided a schedule for implementation of the MR program. STD SUP 17.6-2 incorporated condition monitoring of inaccessible or underground cables into the maintenance rule program. The staff concludes that the relevant information presented in Section 17.6 of the VCSNS COL FSAR meets the requirements of 10 CFR 50.65 and 10 CFR 52.79(a)(15) and is, therefore, acceptable.

18.0 HUMAN FACTORS ENGINEERING

18.1 Overview (No Corresponding Section in Regulatory Guide (RG) 1.206)

Section 18.1 of the V.C. Summer Nuclear Station (VCSNS) combined license (COL) Final Safety Analysis Report (FSAR), Revision 5, incorporates by reference, with no departures or supplements, Section 18.1 of Revision 19 of the AP1000 Design Control Document (DCD). The Nuclear Regulatory Commission (NRC) staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[24] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," and its supplements.

18.2 Human Factors Engineering Program Management (Related to RG 1.206, Section C.I.18.1, "HFE Program Management")

18.2.1 Introduction

The Human Factors Engineering (HFE) Program Management plan describes the HFE program in sufficient detail to ensure that all aspects of the human-system interfaces (HSIs), procedures, staffing, and training are developed, designed, and evaluated on the basis of a structured top-down systems analysis using accepted HFE guidance.

18.2.2 Summary of Application

Section 18.2 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 18.2 of the AP1000 DCD, Revision 19. The advanced safety evaluation (ASE) with confirmatory items for Section 18.2 was based on the VCSNS COL FSAR, Revision 2 and DCD Revision 17. After submitting DCD Revision 17 to the NRC, Westinghouse revised the COL Information Item (COL 18.2-2). This COL information item has been incorporated into Revision 18 of the DCD; however, the discussion of the COL information item below did not change.

In addition, in VCSNS COL FSAR Section 18.2.1.3, the applicant provided the following:

AP1000 COL Information Item

- VCS COL 18.2-2

The applicant provided additional information in VCS COL 18.2-2 to address COL Information Item 18.2-2 related to the emergency operations facility (EOF). In a letter dated September 7, 2010, the applicant proposed to revise VCS COL 18.2-2 to indicate that the EOF and technical support center (TSC) communications strategies and EOF and TSC human factors attributes are addressed in the emergency plan. In addition, the applicant proposed to delete information identifying the location of the EOF from Section 18.2 of the application.

[24] See Section 1.2.2 for a discussion of the staff's review related to verification of the scope of information to be included in a COL application that references a design certification (DC).

License Condition

- License Condition 1, regarding the HFE inspections, tests, analyses and acceptance criteria (ITAAC).

18.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for VCS COL 18.2-2 are given in Chapter 18 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)."

The applicable regulatory requirements for VCS COL 18.2-2 are as follows:

- Title 10 of the *Code of Federal Regulations* (10 CFR) 52.79(c)

The related acceptance criteria are as follows:

- NUREG-0711, "Human Factors Engineering Program Review Model," Revision 2, Section 2.4

- NUREG-0696, "Functional Criteria for Emergency Response Facilities"

18.2.4 Technical Evaluation

The NRC staff reviewed Section 18.2 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the HFE program management. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this safety evaluation report (SER) provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (Vogtle Electric Generating Plant [VEGP], Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs).

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application.

The staff reviewed the information in the VCSNS COL FSAR:

AP1000 COL Information Item

- VCS COL 18.2-2

In its July 31, 2009, response to the NRC staff's RAI-SRP18-COLP-21, Westinghouse Electric Company (WEC) revised COL Information Item 18.2-2. In the revised COL information item, the need to specify the location of the EOF was eliminated. The revised COL information item states:

> Specific information regarding EOF and TSC [Technical Support Center] communications, and EOF and TSC Human Factors attributes will be provided by the Combined Operating License applicant to address the Combined License information requested in this subsection.

In a letter dated September 7, 2010, the applicant proposed to revise Chapter 18 of the VCSNS COL FSAR to indicate that the EOF and TSC communications strategies and EOF and TSC human factors attributes are addressed in the emergency plan. The emergency plan indicates that the EOF and TSC is established consistent with NUREG-0696.

This is acceptable because, as discussed in the following technical evaluation adopted from the BLN SER, an EOF and TSC established consistent with NUREG-0696 would adequately address communications strategies and human factors attributes.

The applicant's commitment to incorporate the change described in the September 7, 2010, letter in a future revision of the VCSNS COL FSAR is being tracked as **Confirmatory Item 18.2-1**.

Resolution of Confirmatory Item 18.2-1

Confirmatory Item 18.2-1 is an applicant commitment to revise its FSAR Section 18.2.1.3 to indicate that the EOF and TSC communications strategies and human factors attributes are addressed in the emergency plan. The staff verified that the VCSNS COL FSAR was appropriately revised. As a result, Confirmatory Item 18.2-1 is now closed.

The applicant stated in its April 30, 2009 response to RAI 18-1 that, rather than using the existing VCSNS Unit 1 EOF, a new common EOF for Units 1, 2, and 3 will be built. The effectiveness of human factors attributes and communications must be demonstrated as part of

ITAAC closure for Emergency Planning following the same protocol as applied to the referenced COL. This protocol is described below.

The following portion of this technical evaluation section is reproduced from Section 18.2.4 of the VEGP SER:

> *The following portion of this technical evaluation section is reproduced from Section 18.2.4 of the BLN SER.*
>
> *In its September 2, 2008, response to RAI 18-3, the applicant stated that the scope of the HFE design includes implementation and verification of applicable EOF/Technical Support Center (TSC) displays consistent with the AP1000 HFE program. TR-136* [Technical Report] *(APP-GW-GLR-136, Revision 1, "AP1000 Human Factors Program Implementation for the Emergency Operations Facility and Technical Support Center") indicates that the Westinghouse DCD does not cover all aspects of the HSI design (such as panel layouts, room configuration, and indications/controls) for the EOF/TSC. The applicant states that the EOF/TSC functions and tasks that are not within the scope of the AP1000 HFE Program will be subject to HFE principles and practices as described in NUREG-0737, "Clarification of TMI [Three Mile Island] Action Plan Requirements."*
>
> *The staff was concerned that, since NUREG-0737 does not have HFE guidance comparable to that of NUREG-0711, EOF/TSC design elements would fall outside the scope of the HFE program. The applicant addressed this concern in its RAI 18-4 response dated February 23, 2009, stating that the HSI design will meet the data and availability criteria in NUREG-0654, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants, Section II.H, 'Emergency Facilities and Equipment,'" which states that the TSC and the EOF will be established in accordance with NUREG-0696.*
>
> *The staff agrees that NUREG-0696 describes an acceptable method for meeting EOF/TSC requirements and contains guidance for managing the EOF/TSC HFE design based on the following:*
>
> - *NUREG-0696, Section 2.8, states, "The design of the TSC data system equipment shall incorporate human factors engineering with consideration for both operating and maintenance personnel."*
> - *NUREG-0696, Section 4.7, states, "The design of the EOF data system equipment shall incorporate human-factors engineering with consideration for both operating and maintenance personnel."*
> - *NUREG-0696, Section 4.8, states, "Human-factors engineering shall be incorporated in the design of the EOF." This section of the NUREG also addresses data availability and human factors design criteria.*
> - *The AP1000 DCD includes a structured approach for identifying data needed to support the EOF/TSC functions.*

- *The guidance in NUREG-0696 addresses information usability. While some guidance is generic, the staff concludes APP-OCS-J1-002, "AP1000 HSI Design Guidelines," which is included by reference in Chapter 18 of the AP1000 DCD, is applicable to the definition of more explicit, measurable design acceptance criteria. Use of these guidelines will ensure that general design principles, such as "callup, manipulation, and presentation of data can be easily performed," and, "display formats shall present information so that it can be easily understood," will be subject to more explicit design acceptance criteria.*

Emergency planning drills and inspections provide repeated opportunities to identify improvements to HSIs. In the case of BLN, for which a common EOF will be used, EOF design improvements have already been implemented based on operating experience.

HFE design verification and validation (V&V) is a second area of NUREG-0711 guidance that is not being directly applied by the applicant. As an alternative, the applicant states in their RAI 18-4 response dated February 23, 2009, that V&V of the EOF HFE design is achieved by the evaluation of equipment and personnel performance during drills and exercises. The staff concludes that although the specific guidance in NUREG- 0711 for V&V is not being applied, the alternative V&V approach provides reasonable assurance that the HFE aspects of the EOF and TSC will be acceptably designed based on the following:

- *NUREG-0696 contains guidance on V&V. Section 9 states, "The design, development, qualification, and installation of the SPDS [safety parameter display system], TSC, EOF, and NDL [nuclear data link] facilities and systems shall be independently verified and validated by qualified personnel other than the original designers and developers."*

  The RAI 18-4 response indicates both equipment and personnel performance will be evaluated during drills and exercises.

- *Exercises and drills are conducted on a periodic basis, and therefore, provide repeated opportunities to test and improve the HSIs.*

- *The first exercise is included as an inspection, test, analysis and acceptance criterion (ITAAC) that ensures EOF/TSC functionality prior to fuel load. The BLN COL application Part 10, "Proposed License Conditions," Revision 1, Table 3.8-1, ITAAC contain the following inspections, tests and analyses:*

  ITAAC 1.1: An inspection of the control room, TSC, and CECC [Central Emergency Control Center] will be performed to verify that they have displays for retrieving facility system and effluent parameters in specific emergency action levels (EALs).

  ITAAC 8.1: A full-participation exercise (test) will be conducted within the specified time periods of Appendix E to 10 CFR Part 50.

- *Exercises and drills are conducted in the actual facilities, (vice a simulator), allowing direct observation of the HSI.*

Evaluation of Site-specific Information Related to Standard Content

Part 10, "Proposed License Conditions," License Condition 1, Table 3.8-1 of the VCSNS COL FSAR includes the following relevant site-specific ITAAC for VCSNS Units 2 and 3 that addresses a verification inspection to ensure functionality of the control room, EOF, and TSC prior to fuel load:

> ITAAC 1.1: An inspection of the Control Rooms, Technical Support Center (TSC), and Emergency Operations Facility (EOF) will be performed to verify that they have displays for retrieving facility system and effluent parameters that are specified in the Emergency Classification and EAL scheme and the displays are functional.
>
> ITAAC 8.1: A full-participation exercise (test) will be conducted within the specified time periods of Appendix E, ["Emergency Planning and Preparedness for Production and Utilization Facilities"] to 10 CFR Part 50.

The staff found that VCSNS ITAAC 1.1 and VCSNS ITAAC 8.1 were comparable to those proposed by VEGP and concluded that the site-specific ITAAC provided an acceptable V&V approach to ensure functionality of the control room, EOF, and TSC from an HFE perspective. Therefore, the conclusions reached by the NRC staff related to VEGP COL 18.2-2 are directly applicable to the VCSNS COL application. These ITAAC will be included in the COL.

The evaluation of these ITAAC from an emergency planning perspective is addressed in SER Section 13.3. License Condition 1 is evaluated in Chapter 1 of this SER.

Correction to the Evaluation of Site-specific Information Text

The section above includes the control room in the staff's conclusions that the site-specific ITAAC provides an acceptable V&V approach. V&V of the control room HFE design is accomplished under a separate program that is within the scope of the DCD and evaluated in NUREG-1793. This conclusion is only applicable to the EOF and TSC. This change does not impact the BLN conclusions and corrects the VCSNS conclusion.

18.2.5 Post Combined License Activities

For the reason discussed in the technical evaluation section above, the staff proposes to include the following Emergency Planning ITAAC proposed by the applicant to ensure functionality of the EOF and TSC HFE design.

- The Licensee shall perform the following ITAAC:

  - ITAAC 1.1: An inspection of the Control Rooms, Technical Support Center (TSC), and Emergency Operations Facility (EOF) will be performed to verify that they have displays for retrieving facility system and effluent parameters that are specified in the Emergency Classification and EAL scheme and the displays are functional.

- ITAAC 8.1: A full-participation exercise (test) will be conducted within the specified time periods of Appendix E to 10 CFR Part 50.

18.2.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to HFE program management, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the requirements of 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," and 10 CFR 52.79, "Contents of applications; technical information in final safety analysis report," and meets the guidance in Chapter 18 of NUREG-0800. The staff based its conclusion on the following:

- VCS COL 18.2-2 is acceptable because the applicant will design the EOF/TSC in accordance with appropriate elements of the AP1000 HFE program and NUREG-0696.

18.3 Operating Experience Review (Related to RG 1.206, Section C.I.18.2, "Operating Experience Review")

Operating experience review (OER) identifies and analyzes HFE-related problems and issues in previous designs. In this way, negative features associated with predecessor designs may be avoided in the current one, while retaining positive features. This section describes the applicant's OER and how it was used to identify HFE-related safety issues. OER includes a summary discussion of the source materials, such as documents, event reports, and personnel interviews. OER-identified issues are included along with their resolution.

Section 18.3 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 18.3 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

18.4 Functional Requirements Analysis and Allocation (Related to RG 1.206, Section C.I.18.3, "Functional Requirements Analysis and Function Allocation")

Functional requirements analysis and function allocation demonstrate that functions are allocated to human and system resources in a manner that takes advantage of human strengths and avoids human limitations. The scope includes identification and analysis of those functions that must be performed to satisfy the plant's safety objectives that is, to prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public.

Section 18.4 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 18.4 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

18.5 AP1000 Task Analysis Implementation Plan (Related to RG 1.206, Section C.I.18.4, "Task Analysis")

Task analyses identify the specific tasks that are needed for function accomplishment and their information, control, and task support requirements. The analyses address how representative and important operations, maintenance, test, inspection, and surveillance tasks are selected, as well as the range of operating modes included in the analyses. This includes the use of probabilistic risk assessment (PRA)/human reliability analysis (HRA) for the identification of the risk-important human actions, including the monitoring and backup of automatic actions. The task analysis results are used as input to the design of HSIs, procedures, and training programs.

Section 18.5 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 18.5 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

18.6 Staffing (Related to RG 1.206, Section C.I.18.5, "Staffing and Qualifications")

18.6.1 Introduction

Staffing and qualification analyzes the requirements for the number and qualifications of personnel in a systematic manner that includes a thorough understanding of task requirements and applicable regulatory requirements.

This section is coordinated with Section 13.1 of this SER, which also relates to organization and staffing. The staffing analysis is iterative in nature and discusses how the initial staffing goals have been reviewed and modified as the analyses associated with other HFE elements are complete. Staffing and qualifications are also shown to be in compliance with 10 CFR 50.54(m).

18.6.2 Summary of Application

Section 18.6 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 18.6 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 18.6, the applicant provided the following:

AP1000 COL Information Item

- STD COL 18.6-1

The applicant provided additional information in Standard (STD) COL 18.6-1 to resolve COL Information Item 18.6-1, addressing staffing level and qualification of plant personnel.

18.6.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for STD COL 18.6-1 are given in Chapter 18 of NUREG-0800.

The applicable regulatory requirements for STD COL 18-1 are as follows:

- 10 CFR 52.79(c)
- 10 CFR 50.54(m)

The related acceptance criterion is as follows:

- NUREG-0711, Section 6.4

18.6.4 Technical Evaluation

The NRC staff reviewed Section 18.6 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to staffing and qualification. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

Although the staff concluded that the evaluation performed for the standard content is directly applicable to the VCSNS COL application, there was a difference in the information provided by the VCSNS applicant from that provided by the VEGP applicant regarding the plant operating experience. This difference is evaluated by the staff below, following the standard content material.

The following portion of this technical evaluation section is reproduced from Section 18.6.4 of the VEGP SER:

AP1000 COL Information Item

The following portion of this technical evaluation section is reproduced from Section 18.6.4 of the BLN SER:

- *STD COL 18.6-1, addressing staffing level and qualification of plant personnel*.

The applicant provided additional information in STD COL 18.6-1 to resolve COL Information Item 18.6-1. COL Information Item 18.6-1 states:

> *Combined License applicants referencing the AP1000 design will address the staffing levels and qualifications of plant personnel including operations, maintenance, engineering, instrumentation and control technicians, radiological protection technicians, security, and chemists. The number of operators needed to directly monitor and control the plant from the main control room, including the staffing requirements of 10 CFR 50.54(m), will be addressed.*

The commitment was also captured as COL Action Item 18.6.3-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *The COL applicant will address the staffing level and qualifications of plant personnel including operations, maintenance and control technicians, radiological protection technicians, security, and chemists. Specifically, the COL applicant will (1) address the staffing considerations in NUREG-0711, and (2) identify the minimum documentation that is necessary for the staff to complete the review.*

Information pertaining to the staffing level and qualifications is contained in BLN COL FSAR Chapter 13 and is summarized here. The applicant provided the estimated staffing levels for different categories of personnel that are addressed by the HFE program in accordance with NUREG-0711. The minimum staffing level for control room personnel is also stated. Information about the staffing level of security personnel is contained in the separately submitted physical security plan. Qualification requirements of Technical Support Personnel, Nuclear Plant Personnel, and Security Personnel are also included.

The baseline level of staffing is derived from experience from current operating nuclear power plants. Iterative adjustments are implemented with input from other elements of the HFE program.

The NRC staff reviewed the resolution to COL Information Item 18.6-1 related to staffing and qualifications included under Section 18.6 of the BLN COL FSAR, Revision 1.

NUREG-0711 states that satisfying criterion 4 for the staffing and qualifications should be in part based on an operating experience review. The applicant addresses this in Chapter 13, Conduct of Operations, by stating:

> *The Tennessee Valley Authority (TVA) has over 30 years of experience in the design, construction and operation of nuclear generating stations. TVA has designed, constructed, and operates six nuclear units at three sites: Browns Ferry Nuclear Plant Units 1, 2, and 3; Watts Bar Nuclear Plant Unit 1; and Sequoyah Nuclear Plant Units 1 and 2.*

NUREG-0711, Criterion 1 states that the staffing and qualifications should address applicable guidance in NUREG-0800, Section 13.1 and 10 CFR 50.54.

Section 18.6 references BLN COL FSAR Section 13, which discusses staffing levels that meet the requirements in 10 CFR 50.54.

NUREG-0711, Criterion 2 states that the staffing analysis should determine the number and background of personnel for the full range of plant conditions including operational tasks, plant maintenance, and plant surveillance and testing.

Section 18.6 of the COL states that Table 13.1-201 of the COL application contains the estimated staffing levels for those categories of personnel that are addressed in NUREG-0711, as follows:

> *1) licensed operators, 2) shift supervisors, 3) non-licensed operators, 4) shift technical advisors, 5) instrumentation and control technicians, 6) mechanical maintenance technicians, 7) electrical maintenance technicians, 8) radiation protection technicians, 9) chemistry technicians, and 10) engineering support.*

The applicant states that the minimum level of control room staffing is also stated in Table 13.1-201 and meets the requirements of 10 CFR 50.54(m).

The staff reviewed the requirements of 10 CFR 50.54, which state:

> *A senior operator licensed pursuant to Part 55 shall be present at the facility or readily available on call at all times during its operations, and shall be present at the facility during initial start-up and approach to power, recovery from an unplanned or unscheduled shut-down or significant reduction in power, and refueling.*

This section of 10 CFR contains a table that describes the minimum staffing requirements in the control room for one, two and three unit sites. For example, a one unit site with one control room is required to maintain two Senior Operators, and two Operators at all times. Table 13.1-201 describes numbers for control room operators that meet these limits and, therefore, meet the requirements for operator staffing in 10 CFR 50.54.

NUREG-0711 states that the applicant should have systematically analyzed the need for the number and qualifications of personnel and have demonstrated a thorough understanding of task requirements and regulatory requirements. NUREG-0711 also references NUREG-0800, Section 13.1 that describes the roles and responsibilities for design and construction activities and pre-operational activities. NUREG-0711 also spells out specific acceptance criteria for providing the NRC with specific information about qualification levels of the staff. In Section 13.1 of the BLN COL FSAR, the applicant describes in detail the organizational structure of the AP1000 plant. The roles and qualifications described include: Management and Technical Support Organization; Engineering; Quality Assurance; Chemistry; Radiation Protection; Fueling and Refueling Support; Training and Development; Maintenance Support; Operations Support; and Fire Protection. Each of these sections describes the applicant's commitment for maintaining qualified staff to carry out the responsibilities of each position. For example, in Section 13.1.1.2.1, "Engineering," the applicant states:

> *The engineering department consists of system engineering, design engineering, engineering programs, and safety and engineering analysis. These groups are responsible for performing the classical design activities as well as providing engineering expertise in other areas. Each of the engineering groups has a functional manager who reports to the manager in charge of engineering and site support.*

The applicant then describes the overall roles that the engineering department is responsible for, such as:

> *Support of plant operations in the engineering areas of mechanical, structural, electrical, thermal-hydraulic, metallurgy and materials, electronic, instrument and control and fire protection. Priorities for support activities are established based*

on input from the plant manager with emphasis on issues affecting safe operation of the plant.

Review Criterion 3 in NUREG-0711 states that the staffing analysis should be iterative, meaning that staffing goals should be reviewed and modified as the analyses associated with other elements are completed. The applicant addresses this criterion by stating:

> *Iterative adjustments are implemented to the staffing, as necessary, based on findings and input from periodic reviews and staffing analysis. Input to this analysis includes information derived from the other elements of the human factors engineering program, particularly operating experience reviews, functional requirements analysis and function allocation, task analysis, human reliability analysis, human-system interface design, procedure development, and training program development.*

The staff finds this information sufficient for meeting the criteria for the level and qualification of staffing contained in NUREG-0711, NUREG-0800, and 10 CFR 50.54.

Evaluation of Site-Specific Information Related to Standard Content

In Section 13.1.1 of the VEGP COL FSAR, the applicant provided site-specific information regarding its operating experience that the staff considered to address the staffing and qualifications basis for NUREG-0711 Criterion 4. The applicant stated:

> *Southern Nuclear Operating Company, Inc. (SNC) has over 30 years of experience in the design, construction, and operation of nuclear generating plants. SNC, with its architectural engineering predecessor Southern Company Services, Inc., has designed, constructed, and currently operates six nuclear units at three sites: Edwin I. Hatch Nuclear Plant Units 1 and 2, Joseph M. Farley Nuclear Plant Units 1 and 2, and Vogtle Electric Generating Plant Units 1 and 2.*

The staff found the VEGP operating experience to be comparable to that described by BLN. Therefore, the Staff finds this information sufficient for meeting the criteria for the level and qualification of staffing described in NUREG-0711, NUREG-0800, and 10 CFR 50.54.

Evaluation of Site-specific Information Related to Standard Content

In Section 13.1.1 of the VCSNS COL FSAR, the applicant provided site-specific information regarding its operating experience that the staff considered to address the staffing and qualifications basis for NUREG-0711 Criterion 4. The applicant stated:

> South Carolina Electric and Gas (SCE&G) has over 35 years of experience in the design, construction, and operation of nuclear generating stations. SCE&G has designed, constructed, and operates VCSNS Unit 1.

Although the VCSNS operating experience is less than that described by VEGP, the staff finds that the VCSNS operating experience is sufficient for meeting the criteria for the level and qualification of staffing described in NUREG-0711, NUREG-0800, and 10 CFR 50.54.

18.6.5 Post Combined License Activities

There are no post-COL activities related to this section.

18.6.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to staffing and qualification, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the acceptance criteria defined in NUREG-0711, Section 6.4. The staff based its conclusion on the following:

- STD COL 18.6-1 is acceptable because it meets the acceptance criteria described in NUREG-0711, NUREG-0800, and 10 CFR 50.54.

18.7 Integration of Human Reliability Analysis with Human Factors Engineering (Related to RG 1.206, Section C.I.18.6, "Human Reliability Analysis")

HRA is an integral activity of a complete PRA. HRA seeks to evaluate the potential for, and mechanisms of, human error that may affect plant safety. Thus, it is an essential element in achieving the HFE design goal of providing a design that will minimize personnel errors, allow their detection, and provide recovery capability.

Section 18.7 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 18.7 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

18.8 Human-System Interface Design (Related to RG 1.206, Section C.I.18.7, "Human System Interface Design")

18.8.1 Introduction

HSI design describes the design process and scope, including the translation of function and task requirements into the detailed design of alarms, displays, controls, and other aspects of the HSI through the systematic application of HFE principles and criteria. It also describes the process by which HSI design requirements are developed and HSI designs are identified and refined.

18.8.2 Summary of Application

Section 18.8 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 18.8 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 18.8, the applicant provided the following:

Tier 2 Departure

- VCS DEP 18.8-1

The applicant proposed a Tier 2 departure (DEP) from the AP1000 DCD related to the location of the TSC and Operational Support Center (OSC).

18.8.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for VCS DEP 18.8-1 are given in Chapter 18 of NUREG-0800.

The applicable regulatory requirements for VCS DEP 18.8-1 are as follows:

- 10 CFR Part 52, "Licenses, certifications, and approvals for nuclear power plants," Appendix D, "Design Certification Rule for the AP1000 Design," Section VIII, "Processes for changes and departures"

- 10 CFR 52.79(c)

18.8.4 Technical Evaluation

The NRC staff reviewed Section 18.8 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the HSI design. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Tier 2 Departure

- VCS DEP 18.8-1

HFE design implementation in the TSC is not location-dependent. Therefore, the proposed location of the TSC between the protected areas of Unit 1 and Units 2 and 3 is acceptable from an HFE program perspective. HFE design elements applicable to the TSC are identified and

implemented in accordance with AP1000 DCD, Chapter 18, which is addressed in Section 18.2.4 of this SER.

The TSC location has the potential to affect technical data availability, communications, power supply reliability, security, and habitability. The acceptability of this location relative to these attributes is addressed in Section 13.3 of this SER.

The OSC is not in the HFE program scope. Therefore, the OSC location change is not evaluated from an HFE program perspective. The OSC location, as it relates to emergency preparedness, is evaluated in Section 13.3 of this SER.

18.8.5 Post Combined License Activities

There are no post-COL activities related to this section.

18.8.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to HSI design, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the acceptance criteria defined in NUREG-0711, Section 8.4. The staff based its conclusion on the following:

- Implementation of HFE design in the TSC is not location-dependent and the HFE design elements applicable to the TSC are in accordance with AP1000 DCD, Chapter 18.

18.9 Procedure Development (Related to RG 1.206, Section C.I.18.8, "Procedure Development")

Procedure development documents, in coordination with VCSNS COL FSAR Section 13.5, ensure that the HFE principles and criteria, along with other design requirements, are incorporated in developing procedures that are technically accurate, comprehensive, explicit, easy to use, and validated. The procedure development program addresses the requirements specified in 10 CFR 50.34(f)(2)(ii) and describes the procedure writer's guide that establishes the process for developing technical procedures. The writer's guide ensures that procedures are consistent in organization, style, and content, and it also specifies which procedures fall within the purview of the guide.

Section 18.9 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 18.9 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding information related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

18.10 Training Program Development (Related to RG 1.206, Section C.I.18.9, "Training Program Development")

18.10.1 Introduction

Training programs help to provide reasonable assurance that plant personnel have the knowledge, skills, and abilities to properly perform their roles and responsibilities. The training program, as discussed in this section, is coordinated with the training discussions in VCSNS COL FSAR Section 13.2, and describes how the training program follows a systems approach to training, and how it addresses the requirements of 10 CFR 50.120, "Training and qualification of nuclear power plant personnel," 10 CFR 52.79(a)(33), and 10 CFR Part 55, "Operators' Licenses."

18.10.2 Summary of Application

Section 18.10 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 18.10 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 18.10, the applicant provided the following:

AP1000 COL Information Item

- STD COL 18.10-1

The applicant provided additional information in STD COL 18.10-1 to resolve COL Information Item 18.10-1, addressing the execution of a training plan.

18.10.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for STD COL 18.10-1 are given in Chapter 18, Section II.A.9 of NUREG-0800.

The applicable regulatory requirements for STD COL 18.10-1 are as follows:

- 10 CFR 52.79(c)

The related acceptance criteria are as follows:

- NUREG-0711, Section 10.4
- Nuclear Energy Institute (NEI) 06-13A, "Template for an Industry Training Program Description," Revision 1

18.10.4 Technical Evaluation

The NRC staff reviewed Section 18.10 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the

complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to training program development. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 18.10.4 of the VEGP SER:

> *The following portion of this technical evaluation section is reproduced from Section 18.10.4 of the BLN SER:*
>
> *AP1000 COL Information Item*
>
> - *STD COL 18.10-1, addressing execution of a training plan*
>
> *The applicant provided additional information in STD COL 18.10-1 to resolve COL Information Item 18.10-1. COL Information Item 18.10-1 refers to Section 13.2, where the COL information item in Section 13.2.1 states:*
>
> > *Combined License applicants referencing the AP1000 certified design will develop and implement training programs for plant personnel. This includes the training program for the operations personnel who participate as subjects in the human factors engineering verification and validation. These Combined License applicant training programs will address the scope of licensing examinations as well as new training requirements.*

The commitment was also captured as COL Action Item 18.10.3-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:

> *With regard to the training program development, the COL applicant will: (1) address the training program development in NUREG-0711; (2) address relevant concerns identified in NUREG-1793; and (3) identify the minimum documentation that the COL applicant will provide to enable the staff to complete its review.*

The NRC staff reviewed the resolution to COL Information Item 18.10-1 related to staffing and qualifications included under Section 18.10 of the BLN COL FSAR, Revision 1. Section 18.10 in the BLN COL FSAR refers to Section 13.1, "Organizational Structure of Applicant," and Section 13.2, "Training," regarding the training program development. In Section 13.2 of the BLN COL FSAR, the applicant provided the referenced, NRC approved, NEI 06-13A [Revision 1], "Template for an Industry Training Program Description" to address COL Information Item 18.10-1. The applicant also noted that a systematic approach to training development will be conducted in accordance with the referenced staff approved WCAP-14655, "Designer's Input for the Training of the Human Factors Engineering Verification and Validation Personnel."

The applicant provided information for the operational programs relating to non-licensed plant staff training, reactor operator training, and reactor operator re-qualification, by referencing NEI 06-13A [Revision 1], "Template for an Industry Training Program Description."

NEI 06-13A was created to provide applicants with a generic program description for use with COL application submittals. In a letter dated March 7, 2007, the staff stated that the template was an acceptable means for describing reactor operator and non-licensed plant staff training programs. The staff finds this approach to be acceptable because NEI 06-13A addresses non-licensed plant staff training, reactor operator training, and reactor operator re-qualification.

18.10.5 Post Combined License Activities

There are no post-COL activities related to this section.

18.10.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to training program development, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and is sufficient to resolve COL Action Item 18.10.3-1. The staff based its conclusion on the following:

- COL Information Item 18.10-1, relating to training, appropriately references Section 13.2 "Training." In Section 13.2, the applicant has committed to using WCAP-14655 to ensure a systematic approach to training development, and the applicant has referenced the staff-endorsed NEI 06-13A, Revision 1.

- Information involving nonlicensed plant staff training, reactor operator training, and reactor operator requalification are acceptably addressed because the applicant referenced NEI 06-13A, Revision 1.

- The staff's review of the VCSNS training program is found in Sections 13.2 and 13.4 of this SER.

18.11 Human Factors Engineering Verification and Validation (Related to RG 1.206, Section C.I.18.10, "Verification and Validation")

Human factors V&V documents the V&V activities confirming that the HSI design conforms to HFE design principles and that it enables plant personnel to successfully perform their tasks to achieve plant safety and other operational goals.

Section 18.11 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 18.11 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

18.12 Inventory (No Corresponding Section in RG 1.206)

The specific sensors, instrumentation, controls, and alarms that are needed to operate the various plant systems constitute the inventory. The instruments, alarms, and controls for each system are documented in the piping and instrumentation diagrams. The minimum inventory required to safely shutdown the reactor and maintain it shutdown is also identified.

Section 18.12 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 18.12 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

18.13 Design Implementation (Related to RG 1.206, Section C.I.18.11, "Design Implementation")

Design implementation verifies that the as-built design conforms to the verified and validated design that resulted from the HFE design process. The scope of the design implementation includes the following considerations:

- V&V of design aspects that cannot be completed as part of the HSI V&V program
- confirmation that the as-built HSI, procedures, and training conform to the approved design
- confirmation that all HFE issues in the tracking system are appropriately addressed

Section 18.13 of the VCSNS COL FSAR, Revision 5, incorporates by reference, with no departures or supplements, Section 18.13 of Revision 19 of the AP1000 DCD. The NRC staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[1] The NRC staff's review confirmed that there is no outstanding issue related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

18.14 Human Performance Monitoring (Related to RG 1.206, Section C.I.18.12, "Human Performance Monitoring")

18.14.1 Introduction

Human performance monitoring is used to assure that no significant safety degradation occurs because of any changes that are made in the plant and to confirm that the conclusions that have been drawn from the integrated system validation remain valid over time. Human performance monitoring is a program that begins after plant operation commences. Therefore, the applicant describes the documentation to be maintained after the program is implemented. The objective of this review is to verify that the applicant has prepared a human performance monitoring strategy for ensuring that no significant safety degradation occurs because of any changes that are made in the plant.

The program describes: (1) a human performance monitoring strategy; (2) how it trends human performance relative to changes implemented in the plant after startup; and (3) how it demonstrates that performance is consistent with that assumed in the various analyses conducted to justify the changes.

The program provides for specific cause determination, trending of performance degradation and failures, and determination of appropriate corrective actions. Detailed implementation plans and procedures for human performance monitoring remain available for NRC review.

18.14.2 Summary of Application

Section 18.14 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 18.14 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 18.14, the applicant provided the following:

AP1000 COL Information Item

- STD COL 18.14-1

The applicant provided additional information in STD COL 18.14-1 to resolve COL Information Item 18.14-1, addressing human performance monitoring after the plant is placed in operation.

18.14.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for STD COL 18.14-1 are given in Chapter 18, Section II A.12 of NUREG-0800.

The applicable regulatory requirements for STD COL 18.14-1 are as follows:

- 10 CFR 52.79(c)

The related acceptance criteria are as follows:

- NUREG-0711, Section 13.4

18.14.4 Technical Evaluation

The NRC staff reviewed Section 18.14 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to human performance monitoring. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure the staff's findings on standard content that were documented in the SER for the reference COL application (VEGP Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2, to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) contains evaluation material from the SER for the BLN Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 18.14.4 of the VEGP SER:

> *The following portion of this technical evaluation section is reproduced from Section 18.14.4 of the BLN SER:*
>
> *AP1000 COL Information Item*
>
> - *STD COL 18.14-1 (COL Action Item 18.13-1)*
>
> *The applicant provided additional information in STD COL 18.14-1 to resolve COL Information Item 18.14-1. COL Information Item 18.14-1 states:*
>
> > *Human performance monitoring applies after the plant is placed in operation, and is a Combined License Applicant responsibility.*
>
> *The commitment was also captured as COL Action Item 18.13-1 in Appendix F of the NRC staff's FSER for the AP1000 DCD (NUREG-1793), which states:*
>
> > *The COL applicant is responsible for human performance monitoring after the plant is placed into operation. The human performance monitoring process implements the guidance and methods as described in DCD Section 18.14 Reference 1 (NUREG-0711).*
>
> *The applicant noted that the human performance monitoring process implements the guidance and methods as described in DCD Section 18.14. The applicant defines a broad outline of the structure of the human performance monitoring process and the assurances that can be obtained through implementation of the process. The human performance monitoring process for risk-informed changes is integrated into the corrective action program, training program, and other programs as appropriate. The cause determination process is also defined. It states that monitoring strategies for human performance trending after the implementation of the design changes are capable of demonstrating that performance is consistent with that assumed in various analyses conducted to justify the changes. Risk-informed changes are screened commensurate with their safety importance to determine if the changes require monitoring.*
>
> *The NRC staff reviewed the resolution of COL Information Item 18.14-1 relating to human performance monitoring included under Section 18.14 of the BLN COL FSAR, Revision 1.*

The BLN COL FSAR describes the human performance monitoring program found in NUREG-0711. It also states:

> *The human performance monitoring process for risk-informed changes is integrated into the corrective action program, training program and other programs as appropriate. Identified human performance conditions/issues are evaluated for human factors engineering applicability.*

Criterion 5 of NUREG-0711 states:

> *As part of the monitoring program, it is important that provisions for specific cause determinations, trending of performance degradation and failures, and corrective actions be included. The cause determination should identify the cause of the failure or degraded performance to the extent that corrective action can be identified that would preclude the problem or provide adequate assurance that it is anticipated prior to becoming a safety concern.*

The applicant's use of cause investigation:

- *Identifies the cause of the failure or degraded performance to the extent that corrective action can be taken consistent with the corrective action program requirements.*

- *Addresses failure significance, which includes the circumstances surrounding the failure or degraded performance, the characteristics of the failure, and whether the failure is isolated or has generic or common cause implications.*

- *Identifies and establishes corrective actions necessary to preclude the recurrence of unacceptable failures or degraded performance in the case of a significant condition adverse to quality.*

The staff has determined that the information included in Section 18.14 of the BLN COL FSAR is consistent with criteria found in NUREG-0711 and is sufficient for the staff to consider COL Information Item 18.14-1 closed.

18.14.5 Post Combined License Activities

There are no post-COL activities related to this section.

18.14.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to human performance monitoring, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical

evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VCSNS COL FSAR is acceptable and meets the acceptance criteria defined in NUREG-0711. The staff based its conclusion on the following:

- STD COL 18.14-1, addressing human performance monitoring after the plant is placed in operation, outlines a structured approach for accomplishing this monitoring.

19.0 PROBABILISTIC RISK ASSESSMENT (RELATED TO RG 1.206, SECTION C.III.1, CHAPTER 19, C.I.19, "PROBABILISTIC RISK ASSESSMENT AND SEVERE ACCIDENT EVALUATION")

Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, certifications, and approvals for nuclear power plants," Subpart C, Section 52.79, "Contents of applications; technical information in final safety analysis report," requires applicants to submit a description of the plant-specific probabilistic risk assessment (PRA) and its results. The PRA provides an evaluation of the risk of core damage and release of radioactive material associated with both internal and external events that can occur during plant operation at power or while shutdown.

Appendix 19A to this safety evaluation (SE) section evaluates the measures identified by the applicant needed to comply with requirements to address loss of large areas (LOLAs) of the plant due to explosions or fires from a beyond-design-basis event (BDBE). These requirements are in 10 CFR 50.54(hh)(2) and 10 CFR 52.80(d). It should be noted that the attachment to Appendix 19A (Attachment A), as well as some documents referenced in Appendix 19A, include security-related or safeguards information. Therefore, Attachment A to Appendix 19A and the references that include security-related or safeguards information, are withheld from the public in accordance with 10 CFR 2.390, "Public inspections, exemptions, requests for withholding."

19.1–19.54, 19.56–19.57, and Appendices 19A–19F Probabilistic Risk Assessment

The V.C. Summer Nuclear Station (VCSNS) combined license (COL) Final Safety Analysis Report (FSAR), Revision 5, incorporates by reference, with no departures or supplements, Sections 19.1 through 19.54, 19.56, 19.57, and Appendices 19A through 19F of the AP1000 Design Control Document (DCD) Revision 19:

19.1, "Introduction"
19.2, "Internal Initiating Events"
19.3, "Modeling of Special Initiators"
19.4, "Event Tree Models"
19.5, "Support Systems"
19.6, "Success Criteria Analysis"
19.7, "Fault Tree Guidelines"
19.8, "Passive Core Cooling System – Passive Residual Heat Removal"
19.9, "Passive Core Cooling System – Core Makeup Tanks"
19.10, "Passive Core Cooling System – Accumulator"
19.11, "Passive Core Cooling System – Automatic Depressurization System"
19.12, "Passive Core Cooling System – In-containment Refueling Water Storage Tank"
19.13, "Passive Containment Cooling"
19.14, "Main and Startup Feedwater System"
19.15, "Chemical and Volume Control System"
19.16, "Containment Hydrogen Control System"
19.17, "Normal Residual Heat Removal System"
19.18, "Component Cooling Water System"
19.19, "Service Water System"
19.20, "Central Chilled Water System"
19.21, "AC Power System"
19.22, "Class 1E DC and UPS System"
19.23, "Non-Class 1E DC and UPS System"

19.24, “Containment Isolation”
19.25, “Compressed and Instrument Air System”
19.26, “Protection and Safety Monitoring System”
19.27, “Diverse Actuation System”
19.28, “Plant Control System”
19.29, “Common Cause Analysis”
19.30, “Human Reliability Analysis”
19.31, “Other Event Tree Node Probabilities”
19.32, “Data Analysis and Master Data Bank”
19.33, “Fault Tree and Core Damage Quantification”
19.34, “Severe Accident Phenomena Treatment”
19.35, “Containment Event Tree Analysis”
19.36, “Reactor Coolant System Depressurization”
19.37, “Containment Isolation”
19.38, “Reactor Vessel Reflooding”
19.39, “In-Vessel Retention of Molten Core Debris”
19.40, “Passive Containment Cooling”
19.41, “Hydrogen Mixing and Combustion Analysis”
19.42, “Conditional Containment Failure Probability Distribution”
19.43, “Release Frequency Quantification”
19.44, “MAAP4.0 Code Description and AP1000 Modeling”
19.45, “Fission Product Source Terms”
19.46 Not used
19.47 Not used
19.48 Not used
19.49, “Offsite Dose Evaluation”
19.50, “Importance and Sensitivity Analysis”
19.51, “Uncertainty Analysis”
19.52, Not used
19.53, Not used
19.54, “Low Power and Shutdown PRA Assessment”

19.56, “PRA Internal Flooding Analysis”
19.57, “Internal Fire Analysis”

Appendix 19A, “Thermal Hydraulic Analysis to Support Success Criteria”
Appendix 19B, “Ex-Vessel Severe Accident Phenomena”
Appendix 19C, “Additional Assessment of AP1000 Design Features”
Appendix 19D, “Equipment Survivability Assessment”
Appendix 19E, “Shutdown Evaluation”
Appendix 19F, “Malevolent Aircraft Impact”

The Nuclear Regulatory Commission (NRC) staff reviewed the application and checked the referenced DCD to ensure that no issue relating to this section remained for review.[25] The NRC staff’s review confirmed that there are no outstanding issues related to these sections. The results of the NRC staff’s technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793, “Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design,” and its supplements.

[25] See Section 1.2.2 for a discussion of the staff’s review related to verification of the scope of information to be included in a COL application that references a design certification (DC).

For the remaining sections of Chapter 19, NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (LWR Edition)," Section 19.0, "Probabilistic Risk Assessment and Severe Accident Evaluation for New Reactors," was the principal source of guidance for the review. NUREG-0800, Section 19.1, "Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," was also used. The acceptability of the risk to public health and safety was determined on the basis of the results and insights derived from the applicant's plant-specific internal events PRA, site-specific assessment of external events, and severe accident evaluations. The staff's evaluation of the remaining sections of Chapter 19 is described below.

19.55 Seismic Margin Analysis

19.55.1 Introduction

The NRC staff reviewed Section 19.55 of the VCSNS COL FSAR, which incorporated Section 19.55 of the DCD with no departures or supplements.

The seismic analysis and design of the AP1000 plant is based on the certified seismic design response spectra (CSDRS) shown in AP1000 DCD Tier 1, Figures 1.0-1 and 1.0-2. These spectra are based on Regulatory Guide (RG) 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants," Revision 1, with an increase in the 25 Hertz (Hz) region to account for increased high-frequency ground motion at some prospective sites. The CSDRS has its dominant energy content in the frequency range of 2 to 10 Hz. An additional analysis was performed for a hard-rock, high-frequency (HRHF) site with spectra corresponding to those shown in AP1000 DCD Tier 1, Figures 1.0-3 and 1.0-4.

19.55.2 Summary of Application

Section 19.55 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 19.55 of the AP1000 DCD, Revision 19.

AP1000 COL Information Item

- VCS COL 19.59.10-6

In a letter dated October 4, 2010, the applicant proposed VCS COL 19.59.10-6, supplementing the VCSNS COL FSAR with a new Section 19.55.6.3, "Site-Specific Seismic Margin Analysis." This plant-specific COL item is in response to a new COL Information Item 19.59.10-6 proposed for the AP1000 DCD in a letter from Westinghouse dated August 23, 2010, regarding confirmation that the seismic margin analysis (SMA) documented in the AP1000 DCD section is applicable to the VCSNS site. Specifically, VCSNS COL FSAR Section 19.55 describes features of the site and provides the applicant's basis for concluding that the seismic margin for VCSNS is bounded by the SMA for the certified design. The advanced safety evaluation (ASE) with confirmatory items for Section 19.55 was based on the VCSNS COL FSAR, Revision 2 and DCD Revision 17. After submitting DCD Revision 17 to the NRC, Westinghouse created a new COL Information Item (COL 19.59.10-6). This COL information item has been incorporated into Revision 18 of the DCD; however, the discussion of the COL information item below did not change.

19.55.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the applicable regulatory requirements for the evaluation of plant-specific information evaluated in Section 19.55 of this safety evaluation report (SER) are as follows:

- 10 CFR 52.79(a)(46), "The final safety analysis report shall include…at a level of information sufficient to enable the Commission to reach a final conclusion on all safety matters that must be resolved…before issuance of a combined license…[a] description of the plant-specific PRA and its results."

- 10 CFR 52.79(d)(1), "If the combined license application references a standard design certification, then the…final safety analysis report need not contain information or analyses submitted to the Commission in connection with the design certification, provided, however, that the final safety analysis report must either include or incorporate by reference the standard design certification final safety analysis report and must contain, in addition to the information and analyses otherwise required, information sufficient to demonstrate that the site characteristics fall within the site parameters specified in the design certification. In addition, the plant-specific PRA information must use the PRA information for the design certification and must be updated to account for site-specific design information and any design changes or departures."

Additional guidance is found in the following documents:

- Interim staff guidance (ISG) in the form of DC/COL-ISG-1, "Interim Staff Guidance on Seismic Issues of High Frequency Ground Motion in Design Certification and Combined License Applications," provides clarifying guidance on implementation of the performance-based approach for determining site-specific ground motion. It also provides guidance on implementation of evaluation methodology to determine the effects of high-frequency ground motion.

- DC/COL-ISG-3, "Probabilistic Risk Assessment Information to Support Design Certification and Combined License Applications," provides clarifying guidance regarding the scope and quality of PRAs being used to support COL applications, and documentation that must be submitted in support of these applications.

  For external events analysis purposes, DC/COL-ISG-3 considers the requirements of 10 CFR 52.79(d)(1) met if the COL applicant compares the site's characteristics to those assumed in the DCD bounding analyses to ensure that the site is enveloped. If the site is enveloped, the COL applicant need not perform further PRA evaluations for these external events. However, the COL applicant should perform site-specific PRA evaluations to address any site-specific hazards for which a bounding analysis was not performed or that are not enveloped by the bounding analyses to ensure that no vulnerabilities due to siting exist.

- DC/COL-ISG-20, "Implementation of a Probabilistic Risk Assessment-Based Seismic Margin Analysis for New Reactors," provides guidance on plant-specific updates of the DC PRA-based seismic margin evaluation for COL applications.

19.55.4 Technical Evaluation

The NRC staff reviewed Section 19.55 of VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to SMA. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

AP1000 COL Information Item

- VCS COL 19.59.10-6

The staff's review of the AP1000 PRA-based SMA is described in Section 19.1.5.1 of NUREG-1793 and its supplements. The AP1000 SMA estimated the high confidence, low probability of failure (HCLPF) capacity of the AP1000 plant in terms of a free-field peak ground acceleration (PGA) expressed in terms of g (the acceleration of gravity). Specifically, in a staff requirements memorandum (SRM) dated July 21, 1993, the Commission approved the following staff recommendation specified in SECY-93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Designs," Section II.N, "Site Specific Probabilistic Risk Assessments and Analysis of External Events," with a modification:

> PRA insights will be used to support a margins type assessment of seismic events. A PRA based seismic margins analysis will consider sequence level HCLPFs and fragilities for all sequences leading to core damage or containment failures up to approximately one and two thirds the ground motion acceleration of the design-basis SSE [safe shutdown earthquake].

A review-level earthquake (RLE) equal to 0.5 g was established in the AP1000 DCD for the SMA and used to demonstrate a margin over the SSE of 0.3 g.

The NRC staff reviewed the proposed additions to Section 19.55 of the VCSNS COL FSAR outlined in the applicant's October 4, 2010, letter, and found that because the ground motion response spectrum (GMRS) for the VCSNS site (presented in VCSNS COL FSAR Figures 2.0-201 and 2.0-202) is bounded by the HRHF spectrum evaluated in the AP1000 DCD, the staff finds that using the SMA provided in the DCD is conservative and acceptable. The incorporation of the planned changes to the VCSNS COL FSAR will be tracked as **Confirmatory Item 19.55-1**.

Resolution of VCSNS Site-Specific Confirmatory Item 19.55-1

Confirmatory Item 19.55-1 is an applicant commitment to revise its FSAR Sections 19.55, 19.59.10.5 and Table 1.8-202 to address a revision to COL Information Item Standard (STD) COL 19.59.10-1 and a new COL Information Item STD COL 19.59.10-6. The staff verified that the VCSNS COL FSAR was appropriately revised. As a result, Confirmatory Item 19.55-1 is now closed.

19.55.5 Post Combined License Activities

There are no post-COL activities identified in this section.

19.55.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to site-specific features that may affect seismic margins in the VCSNS COL FSAR. The information provides sufficient basis to conclude that the incorporation of the SMA documented in the AP1000 DCD is acceptable. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that, the relevant information presented in the VCSNS COL FSAR is acceptable and meets the requirements of 10 CFR 52.79(a)(46) and 10 CFR 52.79(d)(1). The staff based its conclusion on the following:

- VCS COL 19.59.10-6, as it relates to SMA, is acceptable based on the guidance in DC/COL-ISG-3.

19.58 Winds, Floods, and Other External Events

19.58.1 Introduction

Section 19.58 of the VCSNS COL FSAR discusses risks associated with external events other than earthquakes. The staff uses this information to confirm that the total risk represented by core damage frequency (CDF) and large release frequency (LRF) remains acceptably low when accounting for external events.

With respect to external events, the applicant's response to COL Information Item 19.59.10-2 may also affect VCSNS COL FSAR Section 19.58. Therefore, the staff's evaluation of this COL information item is discussed in Section 19.58.4 below.

19.58.2 Summary of Application

Section 19.58 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 19.58 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 19.58, the applicant provided the following:

Supplemental Information

- VCS Supplement (SUP) 19.58-1

In a letter dated December 2, 2009, as supplemented by letter dated October 4, 2010, the applicant provided supplemental information to address a portion of COL Information Item 19.59.10-2. VCSNS COL FSAR Table 19.58-201, "External Event Frequencies for VCSNS Units 2 and 3," documents the site-specific external events evaluation that has been performed for VCSNS Units 2 and 3. This table provides a general explanation of the evaluation and resultant conclusions and provides a reference to applicable sections of the COL where

supporting information is located. The applicant concluded that the VCSNS Units 2 and 3 site is bounded by the high winds, floods and other external events analysis documented in DCD Section 19.58 and no further evaluations are required at the COL application stage.

19.58.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the applicable regulatory requirements for the evaluation of VCS SUP 9.58-1 are as follows:

- 10 CFR 52.79(a)(46), "The final safety analysis report shall include…at a level of information sufficient to enable the Commission to reach a final conclusion on all safety matters that must be resolved…before issuance of a combined license…[a] description of the plant-specific PRA and its results."

- 10 CFR 52.79(d)(1), "If the combined license application references a standard design certification, then the…final safety analysis report need not contain information or analyses submitted to the Commission in connection with the design certification, *provided, however*, that the final safety analysis report must either include or incorporate by reference the standard design certification final safety analysis report and must contain, in addition to the information and analyses otherwise required, information sufficient to demonstrate that the site characteristics fall within the site parameters specified in the design certification. In addition, the plant-specific PRA information must use the PRA information for the design certification and must be updated to account for site-specific design information and any design changes or departures."

DC/COL-ISG-3 provides clarifying guidance regarding the scope and quality of PRAs being used to support COL applications, and documentation that must be submitted in support of these applications.

For external events analysis purposes, DC/COL-ISG-3 considers the requirements of 10 CFR 52.79(d)(1) met if the COL applicant compares the site's characteristics to those assumed in the DCD generic analyses to ensure that the site is bounded. If so, the COL applicant need not perform further PRA evaluations for these external events. However, the COL applicant should perform site-specific PRA evaluations to address any site-specific hazards for which a bounding analysis was not performed or that the prior analysis does not bound to ensure that no vulnerabilities due to siting exist.

19.58.4 Technical Evaluation

The NRC staff reviewed Section 19.58 of the VCSNS COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to winds, floods, and other external events. The results of the NRC staff's evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VCSNS COL FSAR:

Supplemental Information

- VCS SUP 19.58-1

In a letter dated December 2, 2009, as supplemented by letter dated October 4, 2010, the applicant provided a proposed revision to Section 19.58 of the VCSNS COL FSAR to address a portion of COL Information Item 19.59.10-2.

In support of the AP1000 DC amendment, and to address part of COL Information Item 19.59.10-2, the DC applicant submitted APP-GW-GLR-101, "AP1000 Probabilistic Risk Assessment Site-Specific Considerations." This technical report expanded Section 19.58 of the AP1000 DCD with descriptions of its analyses of selected external events at a hypothetical AP1000 site. The DC applicant gathered site-specific data for those external events hazards determined applicable to each of the sites proposing to build AP1000 plants. For each event, it used the most limiting of the parameters provided by the several sites to characterize the generic AP1000 site. This produced a set of bounding analyses for the selected external events. The DC applicant evaluated these limiting external events against the criteria of NUREG-1407, "Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities," suitably modified to account for significantly lower CDF in passive designs.

Section 19.58 of the AP1000 DCD provides an analysis of the capability of the AP1000 design to withstand external flooding, tornadoes, hurricanes, and other site-specific external events. The second portion of COL Information Item 19.59.10-2 in the AP1000 DCD makes the following statement:

> [The] Combined License applicant will confirm that the High Winds, Floods, and Other External Events analysis documented in Section 19.58 is applicable to the COL site. Further evaluation will be required if the COL site is shown to be outside of the bounds of the High Winds, Floods, and Other External Events analysis documented in Section 19.58.

In Section 19.59 of the VCSNS COL FSAR the applicant provided STD COL 19.59.10-2, which included the following paragraph:

> It has been confirmed that the Winds, Floods, and Other External Events analysis documented in DCD Section 19.58 is applicable to the site. The site-specific design has been evaluated and is consistent with the AP1000 PRA assumptions. Therefore, Chapter 19 of the AP1000 DCD is applicable to this design.

Staff Request for Additional Information

Although site-specific information at currently proposed AP1000 sites was considered in performing the generic analyses of AP1000 DCD Section 19.58, details were not made available to the staff in the initial application. The staff issued a request for additional information (RAI) for sufficient information to be able to confirm the basis for concluding that the VCSNS site was bounded by the generic analysis (RAI 19-1).

In a letter dated July 14, 2009, the applicant responded to RAI 19-1 by describing the methodology used to develop the generic external event analysis and providing a table of external event frequencies for VCSNS Units 2 and 3. This table documents the site-specific external events evaluation that has been performed for VCSNS Units 2 and 3. It provides a general explanation of the evaluation and resultant conclusions.

Potential external events and hazards were first screened for applicability to the VCSNS site. For events that were judged applicable, the applicant developed an initiating event frequency and provided this information to Westinghouse for use in the bounding analysis of the generic AP1000 site. Westinghouse developed a limiting event to bound the severity and frequency of all reported events; a hypothetical site for the generic analysis was characterized by these limiting events.

To address the external events in the scope of the generic analysis, the applicant provided a comparison between the AP1000 DCD limiting events and site-specific events in the response to RAI 19-1. Table 1 in the RAI 19-1 response provides an assessment of external event applicability to the VCSNS site (with a brief justification), as well as the applicant's estimate of event frequency for relevant external events.

The staff independently compared these inputs to the event frequencies assumed in the AP1000 DCD.

The staff reviewed the data, the applicability justifications, and the basis for event frequency estimations in this table. Events that were bounded by the external events documented in the AP1000 DCD (no more frequent and no more damaging) required no additional evaluation. Events that are predicted to occur no more than once in ten million years can be screened because they occur so infrequently (frequency less than 1×10^{-7}/year). Events that may occur more frequently but less than once in a million years (frequency less than 1×10^{-6}/year) are assessed to confirm that their consequences make a negligible contribution to core damage frequency (change CDF less than 1×10^{-8}/year). Other events, if any, must be explicitly evaluated and included in the plant-specific PRA.

A number of questions remained, and the staff issued several RAIs requesting additional details and clarification to allow the staff to confirm that the key site-related assumptions in the AP1000 DCD Section 19.58 external events analyses remain valid for the VCSNS site (RAIs 19-77 through 19-81):

- RAI 19-77 requested clarification of the applicant's determination that a particular event was or was not applicable to the site.

- RAI 19-78 requested: (a) the basis for screening; and (b) assessment of risk from events that cannot be screened (to be reported in the FSAR).

- RAI 19-79 requested clarification of the tornado classifications.

- RAI 19-80 requested additional discussion on the adequacy of the sample for representing tornado activity.

- RAI 19-81 requested additional discussion on the adequacy of the sample for extratropical storms.

In a letter dated December 2, 2009, the applicant responded to RAI 19-77 through RAI 19-80 with the requested clarification and discussion. In addition, the applicant revised the table that had been submitted in response to RAI 19-1 and proposed to provide it in a plant-specific supplement to the VCSNS COL FSAR as Table 19.58-201, "External Event Screening for VCS." It documents the basis for the applicant's assessment of risks related to winds, floods, and other external events. The incorporation of the planned changes to the VCSNS COL FSAR will be tracked as **Confirmatory Item 19.58-1**.

Resolution of Confirmatory Item 19.58-1

Confirmatory Item 19.58-1 is an applicant commitment to revise VCSNS COL FSAR Table 19.58-201. The staff verified that VCSNS COL FSAR Table 19.58-201 was appropriately updated. As a result, Confirmatory Item 19.58-1 is now closed.

A summary of the staff's review of each of the external event categories follows.

Winds that would threaten safety-related SSCs (exceed 300 mph)

Because VCSNS safety-related structures, systems, and components (SSCs) are designed to withstand winds of 300 miles per hour (mph), the COL applicant should confirm the assumption that high-wind events exceeding 300 mph are extremely rare (frequency $<1x10^{-7}$ per year). Subsequent to certification of the AP1000 design, the staff issued RG 1.76, "Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants," Revision 1. This guide states that for the continental United States, the staff considers the highest tornado wind speed with a frequency as high as $1x10^{-7}$ to be 230 mph. The expected frequency of 300 mph tornadoes is significantly lower. On the basis that the proposed site is in the continental United States, the staff considers such events at the VCSNS site to be screened from further analysis on the basis of negligible frequency.

High Winds—Tornadoes

The applicant is expected to verify that the frequency of each of the six tornado classes at the proposed site is bounded by the frequency assumed in Section 19.58 of the AP1000 DCD.

In response to RAI 19-77, the applicant found this external event category applicable to the VCSNS site. In response to RAI 19-78, the applicant provided data on observed tornadoes striking Fairfield County, in which the site is located, and eight nearby counties. The applicant used this data, plus data for a tenth county also close to the site, to estimate the frequency of each class of tornado (on the enhanced Fujita scale) using a methodology that is described in Table 19.58-201 of the VCSNS COL FSAR. For each class of tornado, the frequency is less than the values assumed in Section 19.58 of the AP1000 DCD.

The staff finds that the method used to calculate tornado frequencies was conservative and, therefore, acceptable. The staff concludes that the risk from tornados at the VCSNS site is bounded by the risk identified in the AP1000 DCD and that no further analysis is required.

High Winds—Hurricanes and Extratropical Cyclones

The applicant is expected to verify that the frequency of each of the 12 high-wind categories at the proposed site is bounded by the frequency assumed in Section 19.58 of the AP1000 DCD.

In response to RAI 19-77, the applicant identified this external event category as applicable to the VCSNS site. In response to RAI 19-78, the applicant identified the sources of data on which their assessment was based and described their methodology for estimating event frequency.

In a letter dated October 4, 2010, responding to RAI 19-81, the applicant clarified the basis for estimating the frequency of extratropical cyclones. Although the estimated frequency of such storms exceeds that which was assumed in the AP1000 DCD, even the nonsafety-related structures of the plant are designed to withstand winds of significantly higher speeds than can occur in such storms. As a result, the consequences of extratropical cyclones contribute so little to risk that they do not require further analysis.

The staff evaluated the method used to calculate hurricane frequencies and finds that it was realistic and acceptable. The staff concludes that the risk from hurricanes at the VCSNS site is bounded by the risk identified in the AP1000 DCD. In addition, applying the screening criteria documented in the certified design, the staff finds that the consequences of extratropical cyclones present a negligible contribution to risk. For that reason, no further analysis of risk from extratropical cyclones is required.

External Floods

The applicant is expected to verify that the frequency of external flooding at the proposed site is bounded by the frequency assumed in Section 19.58 of the AP1000 DCD. The DCD states that the AP1000 is protected against floods up to the plant ground level. It includes an assessment of risk of flooding from hurricane storm surge. It calls for a site-by-site evaluation of susceptibility to dam failure or flash floods.

In response to RAI 19-77, the applicant identified this external event category as applicable to the VCSNS site. In response to RAI 19-78, the applicant provided additional justification for screening external flooding from further risk analysis for the VCSNS site and cited studies documented in Chapter 2 of the VCSNS COL FSAR. Assessments of storm surge, seiches, precipitation, tsunami, dam failure, and the effects of ice were addressed.

The staff's evaluation of the applicant's hydrologic analyses is presented in Section 2.4 of this SER. The staff concludes that the applicant has demonstrated that consequential flooding from external sources is so unlikely that it can be screened from further risk analysis.

Transportation and Nearby Facility Accidents—Aviation Accidents

The applicant is expected to demonstrate that it is bounded by Section 19.58 of the AP1000 DCD by limiting impact frequencies to 1.2×10^{-6} per year by small aircraft and 1.0×10^{-7} per year by commercial size aircraft. The bounding analysis for a small aircraft in the AP1000 DCD assumes that the impact would result in a loss of offsite power initiating event with subsequent loss of nonsafety-related systems. Larger (commercial) aircraft may have the capacity to challenge safety-related SSCs, although some safety-related systems are expected to survive and remain functional.

In response to RAI 19-77, the applicant identified this event category as applicable to the VCSNS site, which provides details of aircraft impact analysis. The contribution to risk from flights using nearby airports was screened on the basis of criteria in NUREG-0800 Section 3.5.1.6, "Aircraft Hazards." The applicant determined that Airway V53 is the only one

close enough to require further review and computed the estimated frequency of an accident arising from aircraft using that airway would be 3.64×10^{-8} per year. On this basis, aircraft hazards were screened from further risk analysis.

Transportation and Nearby Facility Accidents—Marine Accidents

There are two event subcategories of marine accidents: toxic materials and explosive hazards. The applicant is expected to verify that the limiting initiating event frequency of 1×10^{-6} per year is not exceeded for explosions that could affect the plant. Neither is this frequency to be exceeded for the release of toxic materials toward the plant (which can affect plant and control room habitability). Because the rivers or reservoirs near the site are not used as commercial transport waterways, the applicant considers that this event is not applicable to the site.

The staff finds that because there is no commercial shipping or barge traffic on waterways near the site, marine accidents need not be considered for the VCSNS site.

Transportation and Nearby Facility Accidents—Rail Accidents

There are two event subcategories of railway hazards: toxic materials and explosive hazards. In response to RAI 19-77, the applicant found that neither event category applies to the VCSNS site. Accordingly, the applicant does not further evaluate risk from rail-borne explosives or toxic materials. The safe standoff distance for an explosive hazard (based on a tank car of isopropanol) is less than the distance from the site boundary to the nearest railway.

In response to RAI 19-78, the applicant referenced VCSNS COL FSAR Section 2.2.3, which provides a more detailed analysis of this scenario.

The staff's assessment of these accidents is documented in Chapter 2 of this SER. The staff concludes that they do not contribute to risk of core damage and that no further evaluation of risk from these accidents is required.

Transportation and Nearby Facility Accidents—Truck Accidents

There are two event subcategories of hazards from trucking: toxic materials and explosive hazards. In response to RAI 19-77, the applicant found that neither event category applies to the VCSNS site. Accordingly, the applicant does not further evaluate risk from explosives or toxic materials transported by truck. The safe standoff distance for an explosive hazard is less than the distance from the site boundary to the nearest highway. In any case, the consequence is bounded by that of an onsite explosion of a tank truck of gasoline, which does not contribute to risk of core damage.

Additionally, in response to RAI 19-78, the applicant referenced VCSNS COL FSAR Section 2.2.3, which provides a more detailed analysis of explosions and toxic material releases from trucks.

The staff's assessment of these accident analyses is documented in Chapter 2 of this SER. The staff concludes that they do not contribute to risk of core damage and no further evaluation of risk from truck accidents is required.

Transportation and Nearby Facility Accidents—Pipelines

In response to RAI 19-77, the applicant states that there is a 12-inch natural gas pipeline more than a mile from the VCSNS site. In VCSNS COL FSAR Chapter 2, the distance from this pipeline to the nearest safety-related structure is provided; it exceeds 2 kilometers (km). Because the limiting event evaluated for pipeline-related explosion in the AP1000 DCD was a 76 centimeter (cm) (30-inch) pipe at a distance of 1700 meters (m) (5800 feet) from the plant, the applicant states that explosion hazards due to pipeline accidents can be screened from further evaluation.

The staff finds that because the risk from pipeline explosion or toxic gas release is bounded by the AP1000 analysis, no further evaluation is required.

Transportation and Nearby Facility Accidents—Nearby Facilities

Section 19.58.2.3 of the AP1000 DCD, "Transportation and Nearby Facility Accidents," indicates that this section discusses events that "consist of accidents related to transportation near the nuclear power plant and accidents at industrial and military facilities in the vicinity."

Section 2.2 of the VCSNS COL FSAR states that there are no military facilities within 20 miles of the VCSNS site. The applicant identifies all industrial facilities within five miles of the plant. Except for alternative fuel for combustion turbines (stored more than 2.2 km from safety-related structures) each of the explosive or hazardous materials associated with facilities within five miles were evaluated.

The staff's assessment of the applicant's analysis is documented in Chapter 2 of this SER. Because accidents at nearby facilities do not have consequences that contribute to risk, the staff finds that they can be screened from further analysis.

External Fires

The AP1000 DCD calls for the applicant to "reevaluate the qualitative screening of external fires" and perform a risk assessment if it cannot be demonstrated that the frequency of hazard is less than 1×10^{-7} per year.

External fires are discussed in VCSNS COL FSAR Chapter 2. On the basis of the distance separating the plant from potential external fires, the applicant concluded that safe operation of the plant is not jeopardized by external fires.

Because external fires do not contribute to risk, the staff finds that no further evaluation of risk from external fires is required.

Summary

On the basis of this additional information, the staff confirmed that for all external events that contribute to risk, the parameters used for the AP1000 DCD external events analysis bound the reported parameters of the VCSNS site. The staff concludes that the incorporation of AP1000 DCD Section 19.58 by reference with plant-specific supplemental information is acceptable.

19.58.5 Post Combined License Activities

There are no post-COL activities related to this section.

19.58.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to winds, floods, and other external events, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff concludes, that the relevant information presented in STD COL 19.59.10-2 is consistent with the requirements of 10 CFR 52.79(a)(46) and 10 CFR 52.79(d)(1) and is, therefore, acceptable.

19.59 PRA Results and Insights

19.59.1 Introduction

This section describes the use of the PRA in the design process. It also provides an overall summary of PRA results, including those from the following analyses:

- full power, internal events PRA (both Level 1 and Level 2, providing information on CDF and LRF)
- shutdown and low power events PRA (both Level 1 and Level 2 PRA, with information on CDF and LRF)
- internal flooding assessment (both Level 1 and Level 2 PRA, with information on CDF and LRF for both full power and shutdown/low power conditions)
- internal fire assessment (both Level 1 and Level 2 PRA, with information on CDF and LRF for both full power and shutdown/low power conditions)
- SMA

In addition, this section discusses key insights from the PRA. It describes those plant features that are important to risk. It also provides information on where the PRA was used to support the certification of the AP1000 design, such as the assessment of design alternatives and scoping of the reliability assurance program.

19.59.2 Summary of Application

Section 19.59 of the VCSNS COL FSAR, Revision 5, incorporates by reference Section 19.59 of the AP1000 DCD, Revision 19.

In addition, in VCSNS COL FSAR Section 19.59.10.5, the applicant provided the following:

AP1000 COL Information Items

- STD COL 19.59.10-1

The applicant provided additional information in STD COL 19.59.10-1 to address COL Information Item 19.59.10-1. This item will evaluate any differences between the as-built plant and the certified design to confirm that seismic margins remain adequate.

- STD COL 19.59.10-2

The applicant provided additional information in STD COL 19.59.10-2 to address COL Information Item 19.59.10-2. The portion of this item dealing with evaluation of the as-built plant for conformance to the design modeled in the AP1000 PRA was originally identified in Revision 15 of the AP1000 DCD as a COL applicant's responsibility. It was subsequently identified as a COL holder's responsibility.

The portion of COL Information Item 19.59.10-2 dealing with the site-specific PRA for external events remains the responsibility of the COL applicant and is discussed in Section 19.58 of this SER.

- STD COL 19.59.10-3

The applicant provided additional information in STD COL 19.59.10-3 to address COL Information Item 19.59.10-3. This item will evaluate any differences between the as-built plant and the certified design to confirm that there are no significant adverse changes to the internal fire and internal flood analysis results.

- STD COL 19.59.10-4

The applicant provided additional information in STD COL 19.59.10-4 to address COL Information Item 19.59.10-4. The COL applicant states that severe accident management guidance (SAMG) is implemented on a site-specific basis.

- STD COL 19.59.10-5

The applicant provided additional information in STD COL 19.59.10-5 to address COL Information Item 19.59.10-5. This item, thermal lag assessment of the as-built equipment required to mitigate severe accidents, must be completed prior to initial fuel loading (for equipment that has not been tested at severe accident conditions).

- VCS COL 19.59.10-6

In a letter dated October 4, 2010, the applicant proposed to add VCS COL 19.59.10-6 to reflect a revision proposed by Westinghouse in a letter dated August 23, 2010, regarding confirmation that the SMA documented in the AP1000 DCD section is applicable to the VCSNS site. This COL information item is evaluated in SER Section 19.55.4.

Section 19.59 of the VCSNS COL FSAR adds Section 19.59.10.6 to include the following:

Supplemental Information

- STD SUP 19.59-1

The applicant provided the following supplemental information, discussing the processes for:

– maintaining the PRA to reflect the as-built, as-operated plant

– upgrading the PRA to incorporate improved methodologies and other information, as well as ensuring that it continues to meet the required NRC-endorsed consensus standards

– maintaining proper quality controls on the PRA, including computer codes used to support PRA quantification

– maintaining the PRA documentation current

– using the PRA in applications, including those that support decision making

In addition, the applicant describes where the VCSNS PRA is expected to provide input to other programs and processes.

License Conditions

- Part 10, License Condition 2

The proposed license condition identifies required actions that cannot be accomplished until a license is granted. It provides milestones for their completion.

- Part 10, License Condition 6

The proposed license condition requires submittal of a schedule to support NRC inspections of operational programs, including those related to implementation of SAMG.

19.59.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793 and its supplements.

In addition, the following regulations apply to Sections 19.59.10.5 and 19.59.10.6 of the VCSNS COL FSAR:

- 10 CFR 50.71(h)(1), "No later than the scheduled date for initial loading of fuel, each holder of a combined license under subpart C of 10 CFR Part 52 shall develop a level 1 and a level 2 probabilistic risk assessment (PRA). The PRA must cover those initiating events and modes for which NRC-endorsed consensus standards on PRA exist one year prior to the scheduled date for initial loading of fuel."

- 10 CFR 50.71(h)(2), "Each holder of a combined license shall maintain and upgrade the PRA required by paragraph (h)(1) of this section. The upgraded PRA must cover initiating events and modes of operation contained in NRC-endorsed consensus standards on PRA in effect one year prior to each required upgrade. The PRA must be upgraded every four years until the permanent cessation of operations under 10 CFR 52.110(a) of this chapter."

- 10 CFR 52.79(a)(46), "The final safety analysis report shall include…at a level of information sufficient to enable the Commission to reach a final conclusion on all safety matters that must be resolved…before issuance of a combined license:…[a] description of the plant-specific probabilistic risk assessment (PRA) and its results."

- 10 CFR 52.79(a)(38), "The final safety analysis report shall include…at a level of information sufficient to enable the Commission to reach a final conclusion on all safety matters that must be resolved…before issuance of a combined license :…a description and analysis of design features for the prevention and mitigation of severe accidents…."

- 10 CFR 52.79(d)(1), "If the combined license application references a standard design certification, then the…final safety analysis report need not contain information or analyses submitted to the Commission in connection with the design certification, *provided, however*, that the final safety analysis report must either include or incorporate by reference the standard design certification final safety analysis report and must contain, in addition to the information and analyses otherwise required, information sufficient to demonstrate that the site characteristics fall within the site parameters specified in the design certification. In addition, the plant-specific PRA information must use the PRA information for the design certification and must be updated to account for site-specific design information and any design changes or departures."

NUREG-0800 provides the following guidance:

- Section 19.0, Section III.1.C provides guidance for reviewing a COL application referencing a DC, with emphasis on documented assumptions and insights from the PRA.

- Section 19.0, Section III.3 provides guidance for reviewing COL action items.

- Section 19.1 provides information regarding the review of the technical adequacy of a design-specific, site-specific PRA.

Additional guidance is found in the following documents:

- RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Revision 1, provides guidance on determining whether a PRA provides an adequate basis for issuing a COL.

- DC/COL-ISG-3 clarifies the staff's expectations for information to be included in the COL application.

- SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance

Criteria," establishes expectations for reporting scheduled implementation of operational programs.

19.59.4 Technical Evaluation

The NRC staff reviewed Section 19.59 of the VEGP COL FSAR and checked the referenced DCD to ensure that the combination of the DCD and the COL application represents the complete scope of information relating to this review topic.[1] The NRC staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to the PRA results and insights. The results of the NRC staff's evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

Section 1.2.3 of this SER provides a discussion of the strategy used by the NRC to perform one technical review for each standard issue outside the scope of the DC and use this review in evaluating subsequent COL applications. To ensure that the staff's findings on standard content that were documented in the SER for the reference COL application (Vogtle Electric Generating Plant (VEGP), Units 3 and 4) were equally applicable to the VCSNS Units 2 and 3 COL application, the staff undertook the following reviews:

- The staff compared the VEGP COL FSAR, Revision 2 to the VCSNS COL FSAR. In performing this comparison, the staff considered changes made to the VCSNS COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content evaluation were endorsed.

- The staff verified that the site-specific differences were not relevant.

The staff has completed its review and found the evaluation performed for the standard content to be directly applicable to the VCSNS COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. Section 1.2.3 of this SER provides an explanation of why the standard content material from the SER for the reference COL application (VEGP) includes evaluation material from the SER for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application.

The following portion of this technical evaluation section is reproduced from Section 19.59.4 of the VEGP SER:

AP1000 COL Information Items

- *STD COL 19.59.10-1*

The NRC staff reviewed STD COL 19.59.10-1, which is related to the seismic margin evaluation found in Section 19.55 of the AP1000 DCD, incorporated by reference into the BLN COL FSAR. RAI 19-1 requested justification of an apparent difference between STD COL 19.59.10-1 and the corresponding information item in the DCD. The applicant revised BLN COL FSAR Section 19.59.10.5 as follows:

The requirements to which the equipment is to be purchased are included in the equipment specifications. Specifically, the equipment specifications include:

1. *Specific minimum seismic requirements [are] consistent with those used to define the Table 19.55-1 [high confidence, low probability of failure] HCLPF values. This includes the known frequency range used to define the HCLPF by comparing the required response spectrum (RRS) and test response spectrum (TRS). The range of frequency response that is required for the equipment with its structural support is defined.*

2. *Hardware enhancements that were determined in previous test programs and/or analysis programs will be implemented.*

This is consistent with the AP1000 DCD, and is therefore acceptable to the staff. As a result, the staff considers RAI 19-1 to be closed.

STD COL 19.59.10-1 states that this should be completed prior to initial fuel load, rather than at the time of the COL application. The required comparison cannot be performed until completion of fabrication, installation, and construction of SSCs, and the as-built review of the seismic margin evaluation.

The NRC staff concluded in Section 19.1.5.1 of NUREG-1793 that the methodology for calculating the HCLPF values complied with the relevant regulatory requirements, based on the certified seismic design response spectra (CSDRS). The staff concludes that it is acceptable to complete the final verification of seismic margins when the walkdowns are performed after the plant is built.

- STD COL 19.59.10-2

As noted in SER Section 19.59.2 above, this COL information item has two parts. The first part requires the COL holder to compare the as-built plant to the design used as the basis for the AP1000 PRA and DCD Table 19.59-18 (which was incorporated by reference into Chapter 19 of the applicant's FSAR). The COL holder must update the site-specific PRA to reflect differences if they potentially result in a significant increase in CDF or LRF.

Revisions to 10 CFR Part 52 and related rules were issued after the initial AP1000 DC, but prior to the submittal of the VCSNS COL application. Two of them, 10 CFR 52.79(d)(1) and 10 CFR 50.71(h), require that a COL application provide a description of a site-specific PRA, and that this PRA will, by fuel load, cover initiating events and modes of operation included in industry consensus PRA standards endorsed by the NRC no earlier than one year prior to the scheduled fuel load date. Additional guidance was provided in DC/COL-ISG-3, which states, "PRA maintenance should commence at the time of application for both DC and COL applicants. This means that the PRA should be updated to reflect plant modifications if there are changes to the design." DC/COL-ISG-3 also clarifies the staff position on what constitutes a significant change in PRA results.

The staff requested clarification in RAI 19-2 of how the VCSNS PRA will be updated to account for VCSNS site-specific information by fuel load. It also requested a definition of a "significant increase."

In response to RAI 19-2, the applicant indicated that the PRA would be updated as described in VCSNS COL FSAR Section 19.59.10.5. PRA updating will include evaluation of as-built plant differences, departures from the certified design, and a plant-specific review of all the PRA insights and assumptions as documented in AP1000 DCD Table 19.59-18. The applicant revised VCSNS COL FSAR Section 19.59.10.5 to clarify that any differences found would be evaluated and that the plant-specific PRA model would be modified as necessary to reflect both the plant-specific design and PRA-based insights.

The staff agrees that the applicant's response meets the expectations of 10 CFR 52.79(d)(1) regarding the requirement for a site-specific PRA, as well as the additional guidance described in DC/COL-ISG-3. STD COL 19.59.10-2 now states that evaluation of the as-built plant should be completed prior to initial fuel load, rather than at the time of the COL application. The required updates cannot be finalized until completion of fabrication, installation, and construction.

The NRC staff concluded in Section 19.1.9 of NUREG-1793 that the quality and completeness of the AP1000 PRA are adequate and satisfy the regulatory requirements. The methodology for upgrading and updating the plant-specific PRA described in the VCSNS COL FSAR satisfies the guidance of RG 1.200 and is, therefore, acceptable to the staff. The staff concludes that it is acceptable to update the plant-specific PRA when walkdowns are performed after the plant is built. This is consistent with the 10 CFR 50.71(h) requirement that the plant-specific PRA reflect the risk profile of the as-built, as-operated plant.

The second portion of this COL information item involves a review of site-specific external events to confirm that they are bounded by the external events addressed in the generic risk assessment for the AP1000 design. The staff's evaluation of this review is documented in Section 19.58 of this SER.

The following portion of this technical evaluation section is reproduced from Section 19.59.4 of the VEGP SER:

- *STD COL 19.59.10-3*

In response to RAI 19-20, the applicant proposed a change to its response to STD COL 19.59.10-3 to the effect that plant-specific internal fire and internal flood analysis will be evaluated and the analysis modified as necessary to account for the plant-specific design, and any design changes or departures from the certified design.

The staff reviewed STD COL 19.59.10-3, which is related to the internal fire and internal flood analyses evaluation included under Sections 19.56 and 19.57 of the AP1000 DCD, incorporated by reference in the BLN COL FSAR.

The NRC staff discussed, in Sections 19.1.5.2 and 19.1.5.3 of NUREG-1793, the methodology for assessing the risk from internal fire and floods, respectively. In Section 19.1.9, the staff concluded that the quality and completeness of the AP1000 PRA are adequate and satisfy the applicable regulatory requirements.

Because the as-built configuration cannot be assessed until construction is complete, the staff finds that it is acceptable to update internal fire and flood analyses if the need to do so is identified when walkdowns are performed after the plant is built.

In a letter dated April 15, 2009 (ML091100173), the applicant proposed to revise its response to STD COL 19.59.10-1 through 19.59.10-3 and to revise License Condition 2 to conform to the revised wording of these three STD COL items. The staff identifies incorporation of these changes as Confirmatory Item 19.59-1.

Resolution of Standard Content Confirmatory Item 19.59-1

Confirmatory Item 19.59-1 required the applicant to revise the proposed License Condition 2 (in Part 10 of the application) to reflect the revised wording of STD COL 19.59.10-1 through 19.59.10-3. The NRC staff verified that the proposed License Condition 2 in Part 10 of the application was updated to reflect the above. As a result, Confirmatory Item 19.59-1 is resolved.

The following portion of this technical evaluation section is reproduced from Section 19.59.4 of the BLN SER:

- *STD COL 19.59.10-4*

The AP1000 DCD closed this COL information item with respect to the development of the SAMG. The COL holder will implement the AP1000 SAMG.

For STD COL 19.59.10-4 in Section 19.59.10 of the BLN COL FSAR, the applicant states, "The AP1000 Severe Accident Management Guidance (SAMG) from APP-GW-GLR-070, Reference 1 of DCD Section 19.59, is implemented on a site-specific basis." In Table 1.8-202 of the BLN COL FSAR, the applicant identifies this as a COL holder item. In response to RAI 19-3, the applicant revised its response to STD COL 19.59.10-4 in the BLN COL FSAR. The staff found this response incomplete and issued RAI 19-21.

In a letter dated April 15, 2009 (ML091100173), in response to RAI 19-21, the applicant proposed to revise License Conditions 2 and 6 to conform to the revised FSAR wording. Specifically, the applicant proposed to revise License Condition 2, Item 19.59.10-4 to reflect the fact that the SAMG development had been completed in the AP1000 DCD. In addition, the applicant proposed to revise License Condition 6 (Operational Program Readiness in Part 10 of the BLN COL application) to include a schedule for the implementation of site-specific SAMG, thereby supporting NRC inspections of operational programs in the period between issuance of a COL and authorization to load fuel in accordance with 10 CFR 52.103. This is consistent with the staff position documented in SECY-05-0197, and therefore, acceptable to the staff. The staff identifies the incorporation of these changes as Confirmatory Item 19.59-2.

Resolution of Standard Content Confirmatory Item 19.59-2

Confirmatory Item 19.59-2 required the applicant to revise the proposed License Condition 2 (in Part 10 of the application), Item 19.59.10-4, to reflect that the

SAMG development was completed in the AP1000 DCD. In addition, the confirmatory item required that the applicant to revise the proposed License Condition 6 to included a schedule for the implementation of site-specific SAMG. The NRC staff verified that the proposed License Conditions 2 and 6 in Part 10 of the application were updated to reflect the above. As a result, Confirmatory Item 19.59-2 is resolved.

The following portion of this technical evaluation section is reproduced from Section 19.59.4 of the BLN SER:

- *STD COL 19.59.10-5*

The AP1000 DCD, Revision 17, changed the wording of COL Information Item 19.59.10-5 to clarify which equipment requires thermal lag assessment. STD COL 19.59.10-5 in Chapter 19 of the BLN COL FSAR, as well as the COL holder item listed in License Condition 2 (Part 10 of the BLN COL application) have been revised to conform with the AP1000 DCD.

The NRC staff concluded, in Section 19.2.3.3.7.3 of NUREG-1793, that the equipment and instrumentation identified as required to mitigate severe accidents meets the guidance of SECY-93-087 and 10 CFR 50.34(f). In addition, the staff required that the COL applicant referencing the AP1000 certified design perform a thermal response assessment of as-built equipment used to mitigate severe accidents. Since the as-built equipment and configuration are not available until after the COL is issued, the staff concludes that it is acceptable to complete thermal lag assessments prior to fuel load.

<u>COL Action Items from Chapter 19 of NUREG-1793</u>

The staff compared COL information items in Chapter 19 of the AP1000 DCD with the COL action items from NUREG-1793. The staff identified differences between them, which resulted in two RAIs:

<u>RAI 19-6</u>

Two items from NUREG-1793 relate to the training of operators to respond to certain conditions during shutdown. The first calls for the COL applicant to train operators to quickly close containment hatches and penetrations in the event of an accident during Modes 5 or 6. This must be completed before boiling begins in the reactor coolant system (RCS).

The BLN COL FSAR cited APP-GW-GLR-040, "Plant Operations, Surveillance, and Maintenance Procedures." This is the template document for AP1000 procedure generation. The applicant also noted that BLN COL FSAR Section 13.2 incorporates by reference NEI 06-13, "Template for an Industry Training Program Description." Sections 1.1.1.1, 1.1.1.2, 1.1.2, and 1.2.1 of this document focus on training for operations during shutdown, including abnormal and emergency operations. Technical Specification 3.6.8 provides direction for maintaining containment closure capability prior to steaming during Modes 5 and 6, and it is expected that operators will be well versed in technical specification requirements.

The staff finds that this is an acceptable way to ensure that operators will be prepared to close containment hatches in the event of an accident during Mode 5 or 6.

The second calls for operator training in the use of the wide range pressurizer level indication to cross-check the safety-related narrow range hot-leg level instruments. This is to avoid inadvertent over-draining of the RCS, particularly during reduced inventory operation. The staff reviewed Table 19.59-18, "AP1000 PRA-Based Risk Insights." Item 62 of the table explicitly states, "It is important to maximize the availability of the non-safety-related wide range pressurizer level indication during RCS draining operations during cold shutdown. Procedures and training must be developed to encompass this item." BLN COL 19.59.10-2 includes verification of every item in this table by the COL holder, prior to fuel load. This is accomplished by comparing each item to the as-built (and as operated) plant.

The staff finds this to be an acceptable way to confirm that operators are adequately trained on the use of wide range pressurizer level indication as a cross-check on the safety-related narrow range hot-leg level instruments. Therefore, RAI 19-6 is closed.

RAI 19-7

The staff sought more specific information about compensatory measures used to maintain adequate internal fire and flooding detection and suppression capability during maintenance activities that may impair these features.

The applicant responded by indicating that compensatory measures for fire protection are addressed in BLN COL FSAR Section 9.5.1.8.1.2, which describes use of a permit system that controls and documents inoperability of fire protection systems and equipment, and establishes requirements to initiate proper notifications and compensatory actions, such as fire watches, when the inoperability of any fire protection system or component, such as detectors or suppression devices, is identified. The staff reviewed the cited section of the BLN COL FSAR, and found that it adequately addresses situations when maintenance activities potentially impair fire detection and suppression equipment.

The applicant also responded that flooding detection and suppression equipment, such as sump level indicators, are identified as specific design features in BLN COL FSAR Sections 3.4 and 9.3.5. The most important ones, containment sump level indicators, are controlled by technical specification limiting conditions for operations (LCOs) with required actions and completion times. In addition, flood control in other places is managed by a floor drain system, which provides level detection, as well as manual or automatic pump down of the sumps, which collect water entering the floor drains. Administrative procedures described in BLN COL FSAR Section 13.5.1 control maintenance activities and provide for equipment control and, if needed, compensatory action when maintenance activities impair flooding control equipment.

The staff reviewed the references provided by the applicant and finds the applicant's responses provide adequate compensatory action; therefore, RAI 19-7 is closed.

Supplemental Information

- *STD SUP 19.59-1*

The applicant provided supplemental information in BLN COL FSAR Section 19.59.10.6, "PRA Configuration Controls." The applicant discusses how the BLN plant-specific PRA is developed and maintained to reflect the as-built and as-operated plant, as well as how it will be used to support other programs.

The applicant committed to upgrade the Level 1 and Level 2 PRA prior to fuel load to cover those initiating events and modes of operation set forth in NRC-endorsed consensus standards on PRA that are in effect one year prior to the scheduled date of the initial fuel load. In addition, upgrades are completed at least once every four years. This is consistent with 10 CFR 50.71(h) and, therefore, acceptable to the staff.

In addition, the applicant committed to monitor various information sources for changes or new information that could affect the model assumptions or quantification. Plant-specific design, procedure, and operational changes are reviewed for risk impact. A screening process determines whether a PRA update should be performed more frequently, and includes consideration of whether the changes affect the PRA insights. If the changes warrant a PRA update, the update is made as soon as practicable consistent with the importance of the change and the applications being used. Otherwise, changes are tracked and incorporated in the next regularly scheduled update. This is consistent with RG 1.200, Revision 1, and therefore acceptable to the staff.

PRA quality assurance (QA) provisions ensure that personnel involved in PRA are qualified, work is reviewed independently, documentation is adequately controlled, and upgrades to the PRA are peer-reviewed. When assumptions, analyses, or information used previously are changed or determined to be in error, potential impacts to the PRA model are tracked. If errors are found in the PRA model, they are tracked and appropriate corrective action governed by procedures is taken. This is consistent with RG 1.200 and, therefore, acceptable to the staff.

The PRA provides input to various programs and processes, such as implementation of the maintenance rule, reactor oversight process, the reliability assurance program, the program for regulatory treatment of non-safety systems, and the motor-operated valve (MOV) program. The staff agrees that a plant-specific, site-specific PRA, based on the generic PRA for the AP1000 and maintained as described in the BLN COL FSAR, is an appropriate model to provide input to each of these risk-informed activities.

19.59.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff proposes to include the following license conditions:

- License Condition (19-1) – The licensee shall review differences between the as-built plant and the design used as the basis for the AP1000 SMA prior to initial fuel load. The licensee shall perform a verification walkdown to identify differences between the as-built plant and the design. The licensee shall evaluate any differences and shall modify the SMA as necessary to account for the plant-specific design and any design changes or departures from the certified design. The licensee shall compare the as-built SSC HCLPFs to those assumed in the AP1000 seismic margin evaluation prior to initial fuel load. The licensee shall evaluate deviations from the HCLPF values or assumptions in the seismic margin evaluation due to the as-built configuration and final analysis to determine if vulnerabilities have been introduced.

- License Condition (19-2) – The licensee shall review differences between the as-built plant and the design used as the basis for the AP1000 PRA and Table 19.59-18 prior to initial fuel load. The plant–specific PRA-based insight differences shall be evaluated and the plant-specific PRA model modified as necessary to account for the plant-specific design and any design changes or departure from the certification PRA.

- License Condition (19-3) – The licensee shall review differences between the as-built plant and the design used as the basis for the AP1000 internal fire and internal flood analysis prior to initial fuel load. The licensee shall evaluate the plant-specific internal fire and internal flood analyses and shall modify the analyses as necessary to account for the plant-specific design and any design changes or departures from the certified design.

- License Condition (19-4) – Prior to startup testing, the licensee shall implement the site specific severe accident management guidelines. No later than 12 months after issuance of the COL, the licensee shall submit to the Director of the Office of New Reactors (NRO) a schedule, that supports planning for and conduct of NRC inspections of the implementation of site-specific severe accident management guidelines. The schedule shall be updated every 6 months until 12 months before scheduled fuel loading, and every month thereafter until the site-specific severe accident management guidelines have been fully implemented.

- License Condition (19-5) – Prior to initial fuel load, the licensee shall perform a thermal lag assessment of the as-built equipment listed in Tables 6b and 6c in Attachment A of APP-GW-GLR-069, “Equipment Survivability Assessment,” to provide additional assurance that this equipment can perform its severe accident functions during environmental conditions resulting from hydrogen burns associated with severe accidents. This assessment is required only for equipment used for severe accident mitigation that has not been tested at severe accident conditions. The licensee shall assess the ability of the as-built equipment to perform during accident hydrogen burns using the environment enveloping method or the test based thermal analysis method described in Electric Power Research Institute (EPRI) NP-4354, “Large Scale Hydrogen Burn Equipment Experiments.”

19.59.6 Conclusion

The NRC staff reviewed the application and checked the referenced DCD. The NRC staff's review confirmed that the applicant addressed the required information relating to PRA results and insights, and there is no outstanding information expected to be addressed in the VCSNS COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VCSNS COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the relevant information presented in Section 19.59 of the VCSNS COL FSAR is consistent with the requirements of 10 CFR 52.79(a)(46) and 10 CFR 52.79(d)(1) and is, therefore, acceptable.

APPENDIX 19.A LOSS OF LARGE AREAS OF THE PLANT DUE TO EXPLOSIONS OR FIRES

19.A.1 Introduction

In a letter to the U.S. Nuclear Regulatory Commission (NRC), dated July 2, 2009, the South Carolina Electric and Gas Company (SCE&G) submitted Revision 0 of the Loss of Large Areas of the Plant Due to Explosions or Fire Mitigative Strategies Description and Plans (MSD) for V.C. Summer Nuclear Station (VCSNS) Units 2 and 3.

In the submittal, the applicant describes how the requirements to address loss of large areas (LOLAs) of the plant due to explosions or fires from a beyond-design basis event (BDBE) are met. These requirements are in Title 10 of the *Code of Federal Regulations* (10 CFR) 52.80(d) and 10 CFR 50.54(hh)(2). It should be noted that the attachment to this SE section (Attachment A), as well as some documents referenced in this safety evaluation (SE) section, include security-related or safeguards information, and are not publicly available.

The provisions of 10 CFR 52.80(d) require an applicant for a combined operating license (COL) to submit a description and plans for implementation of the guidance and strategies intended to maintain or restore core cooling, containment, and spent fuel pool (SFP) cooling capabilities under the circumstances associated with the LOLAs of the plant due to explosions or fire as required by 10 CFR 50.54(hh)(2).

The provisions of 10 CFR 50.54(hh)(2) require licensees to develop and implement guidance and strategies for addressing the LOLAs of the plant due to explosions or fires from a BDBE. Specifically, guidance and strategies are intended to maintain or restore core cooling, containment, and SFP cooling capabilities including:

- fire fighting
- operations to mitigate fuel damage
- actions to minimize radiological release

19.A.2 Summary of Application

In a letter dated July 2, 2009, the applicant for the VCSNS COL submitted its “Loss of Large Areas of the Plant Due to Explosions or Fire – Mitigative Strategies Description and Plans.” The applicant will incorporate the full, non-redacted version of the MSD, including any applicable changes identified in response to NRC requests for additional information (RAIs), in a future revision to Part 9 of the VCSNS COL application. The redacted version of this MSD will be incorporated into a future revision to Part 14 of the VCSNS COL application. The applicant stated that the LOLA mitigative strategies, including implementation of operational and programmatic aspects of responding to loss of large area events, would be implemented prior to initial fuel load.

License Conditions

- Part 10, License Condition 6

The applicant proposed a license condition in Part 10 of the VCSNS COL application to provide a schedule to support the NRC's inspection of operation programs including the programmatic elements of responding to an event associated with a loss of large areas of the plant due to explosions or fire, prior to initial fuel load.

19.A.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," and its supplements.

The applicable regulatory requirements for loss of large areas of the plant due to explosions or fires are as follows:

- 10 CFR 50.54(hh)(2)
- 10 CFR 52.80(d)

The applicable regulatory guidance include Interim Staff Guidance (ISG) DC/COL-ISG-016, "Compliance with 10 CFR 50.54(hh)(2) and 10 CFR 52.80(d) Loss of Large Areas of the Plant due to Explosions or Fires from a Beyond-Design Basis Event" (not publically available), which provides an acceptable means of meeting the requirements of 10 CFR 50.54(hh)(2) and 10 CFR 52.80(d). The ISG-016 references the February 25, 2005, guidance letter (not publically available) to operating reactor licensees for Phase 1 and the Nuclear Energy Institute (NEI) document NEI 06-12, "B.5.b Phase 2 & 3 Submittal Guideline," Revision 3, for Phases 2 and 3 (not publically available). The DC/COL-ISG-016 takes exception to a few areas of NEI 06-12, and provides additional clarification and enhancement of NEI 06-12 and the staff's guidance letter issued February 25, 2005, based on NRC inspections of operating reactor implementation. The DC/COL-ISG-016 has two attachments: Attachment 1 is titled, "Supplementary Guidance for Implementing Mitigation Strategies," and Attachment 2 is titled, "Experience Gained from Implementation of Temporary Instruction 2515/171 at Currently Licensed Power Reactor Sites and Related Staff Positions."

19.A.4 Technical Evaluation

The staff reviewed the applicant's submittal consistent with the requirements of 10 CFR 52.80(d) and 10 CFR 50.54(hh)(2). The staff also used the guidance in DC/COL-ISG-016 to perform its review. The DC/COL-ISG-016 references the February 25, 2005, guidance letter for Phase 1, and NEI 06-12 for Phases 2 and 3. A discussion of the staff's technical evaluation of the VCSNS Units 2 and 3 submittal is found in Attachment A to Appendix 19.A.

The VCSNS COL applicant provided the LOLA event evaluation via a three-phased approach similar to existing plants and consistent with the NEI 06-12 guidance, Phases 1, 2, and 3. The applicant's MSD, dated July 2, 2009, was written at the programmatic level for licensing approval, and the implementation details and documentation will be made available for inspection by the NRC prior to initial fuel load. In response to NRC staff RAIs, the applicant submitted additional information to clarify the MSD. The applicant's responses to these RAIs are evaluated by the NRC staff in Attachment A to this SE section.

In its submittal of the MSD, the applicant provided a Mitigative Strategies Table (MST), which follows the template guidance in Appendix D to NEI 06-12. The MST addresses various areas and issues pertinent to loss of large areas and describes commitments, including completion dates, for areas that are best resolved closer to the completion of building VCSNS Units 2 and 3. All commitments made in the submittal will be implemented prior to the initial fuel load of the units.

The MST addresses the three phases considered in NEI 06-12. The phases as described in the guidance documents can be mapped to the regulatory requirements and are as follows:

- Phase 1 - Fire Fighting Response Strategy
- Phase 2 – Spent Fuel Pool Cooling
- Phase 3 – Reactor Core Cooling and Fission Product Release Mitigation

Phases 1, 2, and 3 of NEI 06-12 are similar to the three areas included as part of the requirements in 10 CFR 50.54(hh)(2): fire fighting, operations to mitigate fuel damage, and actions to minimize radiological release. However, the three phases are categorized differently. In 10 CFR 50.54(hh)(2), the category of operations to mitigate fuel damage includes both the reactor core and the spent fuel pool, and the category of actions to minimize radiological release is separate. In NEI 06-12, spent fuel pool and reactor core cooling are found in separate phases, and reactor core cooling and fission product release mitigation are combined. Despite the change in the categorization of the phases in NEI 06-12 and the areas of the regulatory requirements, the staff finds all of the necessary information is included in the submittal.

The guidance for Phases 1, 2, and 3 suggests development of certain strategies or processes to mitigate the consequences of a LOLA event. The applicant addressed all of these suggested strategies or processes. In evaluating each plant specific mitigating strategy against its functional objective[26], the staff weighed whether the strategy reasonably can be expected to successfully provide spent fuel pool cooling, or maintain or restore the key safety functions necessary to protect the reactor core and containment. The staff's review considered the expected effectiveness of strategies and the ease and timeliness of strategy implementation.

While some strategies needed to meet 10 CFR 50.54(hh)(2) can be developed and implemented in the near future, some strategies and planning efforts cannot be effectively determined or implemented until the plant is further along in construction. To identify such commitments for future action, the applicant documented areas that would be more appropriately completed prior to the initial fuel load. The staff reviewed the commitments made by the applicant in its submittal and is satisfied that the timing of all procedural or strategy development was appropriately scheduled prior to the initial fuel load.

The MSD has been reviewed by the NRC staff for content using DC/COL-ISG-016, and found to include all strategies considered essential for such a program, and is acceptable. The staff finds that the regulatory requirements of 10 CFR 52.80(d) and 10 CFR 50.54(hh)(2) are met.

The NRC staff has identified as **Confirmatory Item 19.A-1** the revisions to Parts 9 and 14 of the VCSNS COL application to include the MSD proposed by the applicant in its July 2, 2009, letter, as modified in its August 25, 2010 revised COL application, and further modified in a letter

[26] As used here, the functional objective is the basic description of the capabilities of the conceptual strategy(s) as proposed for Phase 2 and 3 by NEI and accepted by NRC.

dated November 8, 2010. The specific modifications to the MSD are discussed in detail in Attachment A to Appendix 19.A of this SER.

The staff determined that there were two versions of a Site-Specific Confirmatory Item 19.A-1 used in Appendix 19.A. For clarification and as referenced in this SE, Site-Specific Confirmatory Item 19.A-1(A) will be used. This Confirmatory Item 19.A-1(A) is now closed as discussed below.

Resolution of Site-Specific Confirmatory Item 19.A-1(A)

Confirmatory Item 19.A-1(A) is an applicant commitment to revise its MSD under Parts 9 and 14 to its COL application to incorporate the described changes. The staff verified that the MSD under Parts 9 and 14 of the VCSNS COL application was appropriately revised. As a result, Confirmatory Item 19.A-1(A) is now closed.

License Conditions

- Part 10, License Condition 6

In RAI 19-95, the staff asked Vogtle Electric Generating Plant (VEGP) to provide a draft license condition to be added to Part 10 of the VEGP Units 3 and 4 COL application related to implementation of mitigative strategies and to submitting schedules to support planning for and conduct of NRC inspections. In its response dated May 24, 2010, VEGP provided a license condition in Part 10 of the VEGP COL application to provide a schedule to support the NRC's inspection of operational programs, including the programmatic elements of responding to an event associated with a loss of large areas of the plant due to explosions or fire, prior to initial fuel load. Although this program is not identified as an operational program in SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria," the proposed license condition is consistent with the policy established in SECY-05-0197 for operational programs in general, and is acceptable. VCSNS endorsed this response as standard material in a letter dated August 2, 2010. Thus, this RAI is closed.

- Managing MSD Commitments

In RAI 19-96, the staff asked VEGP to describe its plans for managing changes to the commitments included in the MSD. In its response dated May 24, 2010, VEGP included a revision to the MSD that states that commitments in the MSD will be captured in the licensee's commitment management program and managed in accordance with the guidance in NEI 99-04, Revision 0, "Guidelines for Managing NRC Commitment Changes," July 1999. This is similar to the approach followed by the operating fleet licensees commitments made under Section B.5.b of the 2002 Interim Compensatory Measures. In its August 2, 2010 letter, VCSNS endorsed this response as standard material.

The NRC staff reviewed specific commitments in the MSD and used these commitments as the basis for the staff's safety conclusion. The staff finds that a commitment management program conforming to the guidance in NEI 99-04, Revision 0, is appropriate for managing the commitments in the MSD. However, the staff proposed that a license condition be included requiring the licensee to use a commitment management program, which conforms to the guidance in NEI 99-04, Revision 0. Subsequently, the staff decided that the most appropriate way to handle the commitments and maintenance of the MSD was to insure that the licensee

maintains the guidance and strategies developed in accordance with 10 CFR 50.54(hh)(2). This language was included in the staff proposed License Condition 19.A-1. Thus, this RAI is closed.

19.A.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff proposes to include the following license condition:

- License Condition (19.A-1) - Prior to initial fuel load, the licensee shall implement the operational and programmatic elements of its mitigative strategies for responding to a LOLA event developed in accordance with 10 CFR 50.54(hh)(2). No later than 12 months after issuance of the COL, the licensee shall submit to the Director of Office of New Reactors, a schedule that supports planning for and conduct of NRC inspection of the operational and programmatic elements of responding to an event associated with a loss of large areas of the plant due to explosions or fires. The schedule shall be updated every 6 months until 12 months before scheduled fuel load, and every month thereafter until these operational and programmatic elements have been fully implemented. The licensee shall maintain the guidance and strategies developed in accordance with 10 CFR 50.54(hh)(2).

19.A.6 Conclusion

The NRC staff reviewed the information provided by the applicant under 10 CFR 52.80(d), the staff concludes that the applicant has adequately followed the guidance of DC/COL-ISG-016; NEI 06-12; and the February 25, 2005, guidance letter. The staff finds that the applicant provided sufficient information at the COL application stage, including commitments made in the VCSNS COL application, to meet the requirements of 10 CFR 52.80(d) and to provide reasonable assurance that the requirements in 10 CFR 50.54(hh)(2) will be met prior to the initial fuel load of VCSNS Units 2 and 3, respectively.

NRC FORM 335
(12-2010)
NRCMD 3.7

U.S. NUCLEAR REGULATORY COMMISSION

BIBLIOGRAPHIC DATA SHEET

(See instructions on the reverse)

1. REPORT NUMBER
(Assigned by NRC, Add Vol., Supp., Rev., and Addendum Numbers, if any.)

NUREG-2153, Volume 2

2. TITLE AND SUBTITLE

Final Safety Evaluation Report for Combined Licenses for Virgil C. Summer Nuclear Station Units 2 and 3

3. DATE REPORT PUBLISHED

MONTH	YEAR
SEPT	2013

4. FIN OR GRANT NUMBER

5. AUTHOR(S)

Denise McGovern

6. TYPE OF REPORT

Technical

7. PERIOD COVERED (Inclusive Dates)

8. PERFORMING ORGANIZATION - NAME AND ADDRESS (If NRC, provide Division, Office or Region, U. S. Nuclear Regulatory Commission, and mailing address; if contractor, provide name and mailing address.)

Division of New Reactor Licensing
Office of New Reactors
U.S. Nuclear Regulatory Commission, Washington, D.C. 20555-0001

9. SPONSORING ORGANIZATION - NAME AND ADDRESS (If NRC, type "Same as above", if contractor, provide NRC Division, Office or Region, U. S. Nuclear Regulatory Commission, and mailing address.)

same as above

10. SUPPLEMENTARY NOTES

Dockets 52-027 and 52-028

11. ABSTRACT (200 words or less)

This final safety evaluation report (FSER) documents the U.S. Nuclear Regulatory Commission (NRC) staff's technical review of the combined license (COL) application submitted by South Carolina Electric & Gas (SCE&G or the applicant), for the Virgil C. Summer Nuclear Station (VCSNS) Units 2 and 3.

By letter dated March 27, 2008, SCE&G submitted its application to the NRC for COLs for two AP1000 advanced passive pressurized water reactors (PWRs) pursuant to the requirements of Sections 103 and 185(b) fo the Atomic Energy Act of 1954, as amended; Title 10 of the Code of Federal Regulations (10 CFR) Part 52, "Licenses, certifications and approvals for nuclear power plants"; and the associated material licenses under 10 CFR Part 30, "Rules of general applicability to domestic licensing of byproduct material"; 10 CFR Part 40, "Domestic licensing of source material"; and 10 CFR Part 70, "Domestic licensing of special nuclear material." These reactors are identified as VCSNS Units 2 and 3, and will be located on the existing VCSNS site in Jenkinsville, South Carolina.

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)

Virgil C. Summer Nuclear Station Units 2 and 3
Combined License (COL)
Final Safety Evaluation Report (FSER)
Inspections, Tests, Analyses and Acceptance Criteria (ITAAC)

13. AVAILABILITY STATEMENT

unlimited

14. SECURITY CLASSIFICATION

(This Page)
unclassified

(This Report)
unclassified

15. NUMBER OF PAGES

16. PRICE

Federal Recycling Program

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

OFFICIAL BUSINESS

NUREG-2153
Volume 2

Final Safety Evaluation Report for Combined Licenses for
Virgil C. Summer Nuclear Station, Units 2 and 3

September 2013