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Volume 2

Final Safety Evaluation Report

Related to the Combined Licenses for Vogtle Electric Generating Plant, Units 3 and 4

Volume 2

Docket Nos. 52-025 and 52-026

Office of New Reactors

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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 Southern Nuclear Operating Company (SNC or the applicant), for the Vogtle Electric Generating Plant (VEGP) Units 3 and 4. The SER also documents the NRC staff's technical review of the limited work authorization (LWA) activities for which SNC has requested approval.

By letter dated March 28, 2008, SNC, acting on behalf of itself and the proposed owners (Georgia Power Company (GPC), Oglethorpe Power Corporation (an electric membership corporation), Municipal Electric Authority of Georgia, and the City of Dalton, Georgia, an incorporated municipality in the State of Georgia acting by and through its Board of Water, Light and Sinking Fund Commissioners), 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 VEGP Units 3 and 4, and will be located on the existing VEGP site in Burke County, Georgia.

In October 2009, SNC supplemented its COL application to include a request for an LWA. The LWA, in accordance with 10 CFR 50.10(d), would authorize installation of reinforcing steel, sumps, drain lines, and other embedded items along with placement of concrete for the nuclear island foundation base slab.

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, 2007), 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 18, 2008). The initial application also referenced the VEGP Early Site Permit (ESP) Application, Revision 4, dated March 28, 2008. Subsequent to the initial application, in its submittal dated December 11, 2009, SNC incorporated by reference the VEGP ESP Application, Revision 5, dated December 23, 2008, as approved by the NRC in the VEGP ESP and LWA (ESP-004), dated August 26, 2009. In a letter dated August 6, 2010, SNC incorporated by reference the three amendments issued (on May 21, 2010; June 25, 2010; and July 9, 2010) to the ESP. In a letter dated June 24, 2011(submittal number 8), SNC incorporated 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 results of the NRC staff's evaluation related to the VEGP ESP are documented in NUREG-1923, "Safety Evaluation Report for Early Site Permit (ESP) at the Vogtle Electric Generating Plant (VEGP) ESP Site."

[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 January 24, 2011. This report is included as Appendix F to this SER.

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 ESP or 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 includes the applicable permit conditions and ITAAC from the ESP. Therefore, Appendix A includes COL and ESP conditions, recognizing that should COLs be issued to the applicant, the ESP will be subsumed into the COLs. 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 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.

[2] An environmental review was also performed of the COL application and its evaluation and conclusions are documented in NUREG-1947, "Final Supplemental Environmental Impact Statement for Combined Licenses (COLs) for Vogtle Electric Generating Plant Units 3 and 4."

CONTENTS

The chapter and section layout of this SER 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 1.206, "Combined License Applications for Nuclear Power Plants"; and (3) the applicant's final safety analysis report. Where applicable, references to other regulatory actions (design certifications, ESPs) are included in the text of the SER.

APPENDICES

FIGURES

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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 permit (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 before the NRC issues that COL.

This FSER describes the results of a review by the NRC staff of a COL application submitted by Southern Nuclear Operating Company (SNC or the applicant), acting on behalf of itself and the proposed owners (Georgia Power Company (GPC), Oglethorpe Power Corporation (an electric membership corporation), Municipal Electric Authority of Georgia, and the City of Dalton, Georgia, an incorporated municipality in the State of Georgia acting by and through its Board of Water, Light and Sinking Fund Commissioners), for two new reactors to be located at the Vogtle Electric Generating Plant (VEGP) 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 serves to identify 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 NRC staff previously prepared an FEIS as part of its review of the VEGP ESP, which is referenced in the VEGP COL application. NUREG-1872, "Final Environmental Impact Statement for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site," was issued in August 2008, and can be accessed through the Agencywide Documents Access and Management System (ADAMS) at ML082260190.[4]

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[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/vogtle/documents/ser-final.html.

For a COL application that references an ESP, the NRC staff, pursuant to 10 CFR 51.75(c), prepares a supplement to the ESP environmental impact statement (EIS) in accordance with 10 CFR 51.92(e). NRC regulations related to the environmental review of COL applications are in 10 CFR Part 51 and 10 CFR Part 52, Subpart C. Pursuant to 10 CFR 51.50(c)(1), a COL applicant referencing an ESP need not submit information or analyses regarding environmental issues that were resolved in the ESP EIS, except to the extent that the COL applicant has identified new and significant information regarding such issues. In addition, under 10 CFR 52.39, "Finality of early site permit determinations," matters resolved in the ESP proceedings are considered to be resolved in any subsequent proceedings, absent identification of new and significant information. The staff issued a supplement to the ESP EIS, NUREG-1947, "Final Supplemental Environmental Impact Statement for Combined Licenses (COLs) for Vogtle Electric Generating Plant Units 3 and 4," for the COL on March 25, 2011, which can be accessed through ADAMS at ML11076A010.

In a letter dated March 28, 2008, the SNC, acting on behalf of itself and the proposed owners, submitted its application to the NRC for COLs for two AP1000 advanced passive pressurized-water reactors (PWRs) (ADAMS Accession No. ML081050133) to be located at the VEGP site. SNC identified the two units as VEGP Units 3 and 4. The VEGP site is located on a coastal plain bluff on the southwest side of the Savannah River in eastern Burke County, Georgia. The site is approximately 26 miles southeast of Augusta, Georgia, and 100 miles northwest of Savannah, Georgia. Directly across from the site, on the eastern side of the Savannah River, is the U.S. Department of Energy's (DOE's) Savannah River site in Barnwell County, South Carolina. The proposed VEGP Units 3 and 4 would be built on the VEGP site adjacent to two existing nuclear power reactors, VEGP Units 1 and 2, operated by SNC.

In October 2009, SNC supplemented its COL application to include a request for an LWA. The LWA, in accordance with 10 CFR 50.10(d), would authorize installation of reinforcing steel, sumps, drain lines, and other embedded items along with placement of concrete for the nuclear island foundation base slab.

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) (submitted May 26, 2007) 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 18, 2008). The initial application also referenced the VEGP Early Site Permit (ESP) Application, Revision 4, dated March 28, 2008. Subsequent to the initial application, in its submittal dated December 11, 2009, SNC incorporated by reference the VEGP ESP Application, Revision 5, dated December 23, 2008, as approved by the NRC in the VEGP ESP and LWA (ESP-004), dated August 26, 2009. In a letter dated August 6, 2010, SNC incorporated by reference the three amendments issued (on May 21, 2010; June 25, 2010; and July 9, 2010) to the ESP. In a letter dated June 24, 2011(submittal number 8), SNC incorporated 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 results of the NRC staff's evaluation related to the VEGP ESP are documented in NUREG-1923, "Safety Evaluation Report for Early Site Permit (ESP) at the Vogtle Electric Generating Plant (VEGP) ESP Site." This FSER presents the results of the staff's review of information submitted in conjunction with the COL application, including any matters that were not already resolved as part of the referenced ESP or the referenced design certification, or subject to resolution in the pending design certification amendment proceeding.

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 the applicable permit conditions and ITAAC from the ESP. Therefore, Appendix A includes COL and ESP conditions, recognizing that should COLs be issued to the applicant, the ESP will be subsumed into the COLs. 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 earlier version of this document, and provided the results of its review to the Commission in a report dated January 24, 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 parts
ACRS	Advisory Committee on Reactor Safeguards
ADAMS	Agencywide Documents Access and Management System
ADS	automatic depressurization system
AE	architect-engineer
AFFF	aqueous film forming foam
ALARA	as low as is reasonably achievable
ALI	annual limits on intake
ALWR	advanced light-water reactor
ANI	American Nuclear Insurers
ANS	American Nuclear Society
ANSI	American National Standards Institute
AOO	anticipated operational occurrence
AOV	air-operated valve
ARS	amplified response spectra
ASCE	American Society of Civil Engineers
ASE	advanced safety evaluation
ASLB	Atomic Safety and Licensing Board
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
BBM	Blue Bluff Marl
BCEMA	Burke County Emergency Management Agency
BDBE	beyond-design basis event
BL	Bulletin
BLN	Bellefonte Nuclear Station
BOP	balance of plant
BPV	Boiler & Pressure Vessel Code (ASME BPV Code)
BTP	Branch Technical Position
BWR	boiling-water reactor
C	Celsius
C&C	command & control
CAS	central alarm station
CAV	cumulative absolute velocity
CCS	component cooling water system
CDA	critical digital asset
CDE	committed dose equivalent

CDF	core damage frequency
CDI	conceptual design information
CDM	certified design material
CECC	Central Emergency Control Center
CEUS	Central and Eastern United States
cfm	cubic feet per minute
CFR	*Code of Federal Regulations*
cGy	centiGray
cm	centimeters
CMT	core makeup tank
COL	combined license
COLA	combined license application
CP	construction permit
cpm	counts per minute
CR	control room
CRDM	control rod drive mechanism
CRDS	control rod drive system
CS	containment system
CS	core supports
CSA	control support area
CSC	Communication Support Center
CSDRS	certified seismic design response spectra
CSP	Cyber Security Plan
CST	cyber security team
CTA	critical target area analysis
CVCS	chemical and volume control system
CVS	portions of the chemical and volume control system
CWS	circulating water system
D/Q	dry deposition factor
DAC	derived air concentration
DAS	Diverse Actuation System
DBA	design-basis accident
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
DECT	Digital Enhanced Cordless Telecommunication
DEP	Departure
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
ED	Emergency Director
EDMG	Extensive Damage Mitigation Guidelines
EIP	emergency implementing procedure
EIS	Environmental Impact Statement
El.	Elevation
ELS	plant lighting system
EMA	Emergency Management Agency
ENC	Emergency News Center
ENN	Emergency Notification Network
ENS	Emergency Notification System
EOC	Emergency Operations Center
EOF	Emergency Operations Facility
EOM	Emergency Offsite Manager
EOP	emergency operating procedure
EP	Emergency Plan
EP	emergency planning
EPA	Environmental Protection Agency
EPAct	Energy Policy Act of 2005
EPC	Engineering, Procurement and Construction
EPI	Emergency Public Information
EPIO	Emergency Public Information Office
EPIP	emergency plan implementing procedures
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 facilities
ERO	emergency response officer
ERO	Emergency Response Organization
ESF	engineered safety feature
ESP	Early Site Permit
ESPA	Early Site Permit Application
ESSX	Electric Switch System Exchange
ETE	evacuation time estimate
ETS	Emergency Telecommunications System
F	Fahrenheit
FAA	Federal Aviation Administration
FAC	flow-accelerated corrosion
FBI	Federal Bureau of Investigation
FCEMS	Fairfield County Emergency Medical Services

FD1W	Feeder Ditch 1
FEIS	final environmental impact statement
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FFD	fitness-for-duty
FIFO	first-in-first-out
FIRS	foundation input response spectra
FIV	flow induced vibration
FMCRD	fine motion control rod drive
FMEA	failure mode and effects analysis
fps	feet per second
FPS	fire protection system
FR	*Federal Register*
FRS	floor response spectra
FSAR	final safety analysis report
FSER	final safety evaluation report
ft	feet
FTS	Federal Telecommunications System
GALL	Generic Aging Lessons Learned
GCC	Georgia Transmission Control Center
GDC	General Design Criteria (Criterion)
GEMA	Georgia Emergency Management Agency
GIS	Geographical Information System
GL	Generic Letter
GMRS	ground motion response spectra
GPC	Georgia Power Company
gpm	gallons per minute
GPSC	Georgia Public Service Commission
GSI	Generic Safety Issue
GSM	Global System for Mobile Communications
GSU	generator step-up
GTS	generic technical specification
GWMS	gaseous waste management system
h	hour
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
HICs	high integrity containers
HLD	heavy lift derrick
HP	health physics
HPN	Health Physics Network
HPS	Health Physics Society
HRA	human reliability analysis
HSI	human-system interface
HV	high voltage

HVAC	heating, ventilation, and air conditioning
Hz	Hertz
I&C	instrumentation and controls
IC	initiating conditions
ICM	Interim Compensatory Measures
ICMO	interim compensatory order
iDEN	Integrated Digital Enhanced Network
IDLH	immediate danger to life and health
IEC	International Electrotechnical Commission
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.	inches
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
ISFSI	independent spent fuel storage installation
ISG	Interim Staff Guidance
ISI	inservice inspection
ISO	International Standardization Organization
ISRS	in-structure response spectra
IST	inservice testing
ITAAC	inspections, tests, analyses, and acceptance criteria
ITP	initial test program
JIC	joint information center
JOG	Joint Owners Group
JTWG	Joint Test Working Group
KI	radio-protective drugs
Kips	kilo pounds
km	kilometers
kPa	kilopascals
kV	kilovolt
kVA	kilovolt amps
kWe	kilowatt electric
LAN	Local Area Network
lb/ft^2	pounds per square foot
LBB	leak-before-break
LCEMS	Lexington County Emergency Medical Services
LCO	limiting condition for operation
LEFM	Leading Flow Edge Meter
LFL	lower flammability limit

LLEA	local law enforcement agency
LLHS	light-load handling system
LLNL	Lawrence Livermore National Laboratory
LLRW	low-level radioactive waste
LOA	Letters of Agreement
LOCA	loss-of-coolant accident
LOLA	loss of large areas
LOOP	loss of offsite power
lpm	liter(s) per minute
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	meter(s)
MC	main condenser
MC&A	material control and accounting
MCL	Management Counterpart Link
MCR	main control room
MEAG	Municipal Electric Authority of Georgia
MEI	maximally exposed individual
MERT	Medical Emergency Response Team
mi	mile(s)
MIT	Massachusetts Institute of Technology
MN	Mega Newton
M-O	Mononobe-Okabe
MOU	Memorandum of Understanding
MOV	motor-operated valve
MOX	mixed-oxide
MPA	methoxypropylamine
mph	miles per hour
MR	Maintenance Rule
MRA	Mutual Recognition Arrangement
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
MVAR	mega volt amp reactive
MW	megawatt
MWe	megawatts electric
MWt	megawatts thermal

NDCT	natural draft cooling tower
NDL	nuclear data ink
NDQAM	Nuclear Development and Construction Quality Assurance Manual
NEI	Nuclear Energy Institute
NEMA	National Electrical Manufacturers Association
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
NNR	non-nuclear safety
NOV	Notice of Violation
NPIR	Nuclear Plant Interface Requirement
NPPENF	Nuclear Power Plant Emergency Notification
NRC	U.S. Nuclear Regulatory Commission
NRO	Office of New Reactors
NS	nonseismic
NSSS	nuclear steam system supply
NUMARC	Nuclear Management and Resources Council
NVLAP	National Voluntary Laboratory Accreditation Program
NWS	National Weather Service
OBE	operating basis earthquake
OCA	owner controlled area
OCL	Operational Center Local
ODCM	Offsite Dose Calculation Manual
OE	operating experience
OER	operating experience review
OHLHS	overhead heavy-load handling system
OM	Operations and Maintenance (ASME OM Code)
OPC	Oglethorpe Power Corporation
OPRAA	operational phase reliability assurance activity
ORE	occupational radiation exposure
ORM	Onsite Radiation Manager
OSC	Operations Support Center
p.u.	per unit
PA	protected area
PAD	protective action decisions
PAG	protected area guidelines
PAR	protective action recommendations
PAZ	protective action zones
PC	Permit Condition
PCC	Power Coordination Center
PCCAWST	passive containment cooling ancillary water storage tank
PCCWST	passive containment cooling water storage tank
PCP	Process Control Program
PCS	passive containment cooling system
PDC	Personal Digital Cellular
PDP	procedure development program
PE	polyethylene

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
PNS	Prompt Notification System
POV	power-operated valve
ppm	parts per million
PRA	probabilistic risk assessment
PRHR	passive residual heat removal
psf	pounds per square foot
PSHA	probabilistic seismic hazard analysis
PSI	preservice inspection
psi	per square inch
psia	pounds per square inch absolute
psig	pounds per square inch gauge
PS-ITAAC	physical security-inspection, test, analysis, and acceptance criteria
PSO	power systems operations
PSP	Physical Security Plan
PSS/E	Power System Simulator for Engineering
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
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
QATR	Quality Assurance Topical Report
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
R-COL	reference combined license

RCP	reactor coolant pump
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
REAC/TS	Radiation Emergency Assistance Center / Training Site
rem	roentgen equivalent man
REMP	radiological environmental monitoring program
REP	radiological emergency preparedness
RERP	radiological emergency response plan
RET	Radiological Emergency Team
RETS	radiological effluent technical specification
RG	regulatory guide
RIS	Regulatory Issue Summary
RLE	review-level earthquake
RMS	radiation monitoring system
RNS	normal residual heat removal system
RO	reactor operator
RPP	Radiation Protection Program
RPV	reactor pressure vessel
RRS	required response spectrum
RSCL	Reactor Safety Counterpart Link
RTDP	revised thermal design procedure
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	second
S&PC	steam and power conversion
SAMG	severe accident management guidance
SAR	safety analysis report
SAS	secondary alarm station
SASSI	system for analysis of soil structure interaction
SAT	systematic approach to training
SBAA	Southern Balancing Authority Area
SBO	station blackout
SC	steel concrete composite
SCBA	self-contained breathing apparatus
SCDPRT	South Carolina Department of Parks, Recreation and Tourism
SCE&G	South Carolina Electric and Gas Company
SCEMD	South Carolina Emergency Management Division
S-COL	subsequent combined license
SCP	Safeguards Contingency Plan
SCSN	South Carolina State Network
SCT	Southern Company Transmission
SE	safety evaluation
SECY	Secretary of the Commission, Office of the Nuclear Regulatory Commission
SER	safety evaluation report

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
SOT	station orientation training
SP	Setpoint Program
SPDS	safety parameter display system
SR	surveillance requirement
SREC	standard radiological effluent control
SRM	Staff Requirements Memorandum
SRO	senior reactor operator
SRP	standard review plan
SRSS	square root sum of squares
SSAR	Site Safety Analysis Report
SSCs	structures, systems, and components
SSE	safe shutdown earthquake
SSEP	safety, security and/or emergency preparedness
SSI	soil structure interaction
SS-ITAAC	site-specific inspections, tests, analyses and acceptance criteria
STAC	short-term availability control
STD	Standard
STS	Standard Technical Specification
SUNSI	sensitive unclassified non-safeguard information
SUP	Supplement
Sv	Sievert
SWMS	solid waste management system
SWS	service water system
T&QP	Training and Qualification Plan
TCS	turbine building closed cooling water system
TDMA	Time Division Multiple Access
TEDE	total effective dose equivalent
TG	turbine-generator
TGS	turbine generator system
TLD	thermoluminescent dosimeter
TMI	Three Mile Island
TNT	trinitrotoluene
TR	technical report
TRS	test response spectrum
TS	Technical Specification
TSC	Technical Support Center
TSO	transmission system operator
TSTF	Technical Specification Task Force
TVA	Tennessee Valley Authority
UAT	unit auxiliary transformer
UBC	Uniform Building Code

UFL	upper flammability limit
UFM	ultrasonic flow meter
UHS	ultimate heat sink
UPS	uninterruptible power supply
USACE	U.S. Army Corps of Engineers
USE	upper shelf energy
USGS	United States Geological Society
UT	ultrasonic
V	volt
V&V	verification and validation
VAR	Variance
VBS	nuclear island non-radioactive ventilation system
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
VOIP	Voice Over Internet Protocol
VPN	Virtual Private Network
WCAP	Westinghouse Commercial Atomic Power
WCS	Waste Control Specialist
WEC	Westinghouse Electric Company
WLS	liquid radioactive waste system
WLS	liquid radwaste system
WWRB	waste water retention basin
WWS	waste water system
YFS	yard fire water system
ZRS	offsite retail power system

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 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 Vogtle Electric Generating Plant (VEGP) 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 VEGP 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 VEGP COL FSAR.

10.1.4 Technical Evaluation

The NRC staff reviewed Section 10.1 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.[5] 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 VEGP 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 with open items issued for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was a confirmatory item (Confirmatory Item 10.1-1) and an open item (Open Item 10.1-1) related to the standard content in the BLN SER. The resolutions are addressed in this SER.

[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).

The following portion of this technical evaluation section is reproduced from Section 10.1.4 of the BLN 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 proposes to include the following license condition:

- 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the information presented in the VEGP 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 10.2 of the AP1000 DCD, Revision 19.

In addition, in VEGP COL FSAR Section 10.2, the applicant provided the following:

Supplemental Information

- STD Supplement (SUP) 10.2-1

The applicant provided supplemental information in VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 the FSER related to the DCD.

In addition, 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 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 T-G. 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no confirmatory or open items related to the standard content in the BLN SER.

The following portion of this technical evaluation section is reproduced from Section 10.2.4 of the BLN 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 proposes to include the following license condition:

- 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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 VEGP 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 in 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 10.3 of the AP1000 DCD, Revision 19.

In addition, in VEGP COL FSAR Section 10.3, the applicant provided the following:

Supplemental Information

- STD SUP 10.3-1

The applicant provided supplemental information in VEGP 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 VEGP 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 VEGP 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 the FSER related to the DCD.

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, "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 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 MSSS. 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no confirmatory or open items related to the standard content in the BLN SER.

The following portion of this technical evaluation section is reproduced from Section 10.3.4 of the BLN 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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 VEGP 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 VEGP 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 non-condensable gases and air from the main condenser during plant startup, cooldown, and normal operation. This action is provided by liquid ring vacuum pumps.

10.4.2.2 *Summary of Application*

Section 10.4 of the VEGP 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.

In addition, in VEGP COL FSAR Section 10.4.2, the applicant provided the following:

Site-Specific Information Replacing Conceptual Design Information

- VEGP CDI

The applicant provided additional information to replace conceptual design information (CDI) in VEGP COL FSAR Section 10.4.2.2.1, "General Description," which describes the cooling water source for the vacuum pump seal water heat exchangers.

- VEGP CDI

The applicant provided additional information to replace CDI in VEGP COL FSAR Section 10.4.2.2.2, "Component Description," which describes the 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 the FSER related to the DCD.

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 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 main condenser evacuation system. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VEGP COL FSAR:

Site-Specific Information Replacing Conceptual Design Information

- VEGP CDI

The applicant provided CDI replacement language as part of the VEGP COL FSAR regarding cooling water for the vacuum pump seal water heat exchangers. The applicant replaced bracketed text in Sections 10.4.2.2.1 and 10.4.2.2.2 of the AP1000 DCD to provide specific information regarding the sources of cooling water for the vacuum pump seal water heat exchangers.

The NRC staff reviewed the site-specific design information provided in the VEGP CDI regarding the text added to Sections 10.4.2.2.1 and 10.4.2.2.2 related to cooling water for the vacuum pump seal water heat exchangers included under Section 10.4 of the VEGP COL FSAR.

The VEGP CDI in VEGP COL FSAR Section 10.4.2.2.1 is related to the CWS supplying cooling water for the main condenser vacuum pump seal water heat exchangers. The VEGP CDI in VEGP COL 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 these additional CDI items will have no adverse affects on the capability of the main condenser evacuation system, or CWS, and associated equipment. Also, the staff concludes that adding this VEGP CDI 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 the VEGP 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 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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:

- VEGP CDI, relating to VEGP 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 controlled releases of radioactive materials to the environment.

- VEGP CDI, relating to VEGP COL FSAR Section 10.4.2.2.2, "General 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 controlled 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 radioactive 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 VEGP 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 VEGP 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 SGs 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 VEGP 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 VEGP 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 VEGP 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 VEGP COL FSAR Section 10.4.5, the applicant provided the following:

AP1000 COL Information Item

- VEGP COL 10.4-1

The applicant provided additional information related to the CWS design parameters in VEGP 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

- VEGP CDI

The applicant provided additional information to replace CDI in VEGP COL FSAR Section 10.4.5, which describes the following various aspects of the 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 the FSER related to the DCD.

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 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 CWS. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VEGP COL FSAR:

AP1000 COL Information Items

- VEGP COL 10.4-1

In VEGP COL FSAR Section 10.4.5, the applicant provided additional information in VEGP 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 the staff's FSER for the AP1000 DCD (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 as VEGP COL 10.4-1 in 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 text concerning chemistry control of the condensate, feedwater, and auxiliary steam system and circulating water chemistry control. The staff reviewed the applicant's information in these FSAR sections.

In VEGP COL FSAR Section 10.4.5.2.1, the applicant described the VEGP site-specific CWS, as specified in VEGP COL 10.4-1. 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 VEGP-specific design parameters in VEGP COL FSAR Table 10.4-202, "Supplemental Design Parameters for Major Circulating Water System Components." Further, in VEGP COL FSAR Section 10.4.5.2.2, the applicant stated that the piping design pressure of the CWS is 115 pounds per square inch gauge (psig). The staff reviewed these site-specific design parameters and compared the corresponding data in the AP1000 DCD Tier 2 Table 10.4.5-1, "Design Parameters for Major Circulating Water System Components." On the basis of its review, the staff finds that the CWS design parameters of temperature and flow rates in VEGP COL FSAR Table 10.4-202 are consistent with the design parameters in the AP1000 DCD Tier 2 Table 10.4.5-1 and are acceptable.

In VEGP 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 are used to control circulating water chemistry for biocide, algaecide, pH adjuster, corrosion inhibitor, scale inhibitor, and silt dispersant functions. Additionally, in Section 10.4.5.5, the applicant identified that circulating water chemistry is controlled by cooling tower blowdown and by chemical injection to maintain the circulating water with an acceptable Langelier Index. The staff finds that the applicant addressed the site-specific chemicals and control and maintenance of CWS chemistry consist with the AP1000 DCD, Tier 2 Sections 10.4.5.2.2 and 10.4.5.5, as specified in the COL information item in Section 10.4.12.1 of the AP1000 DCD.

The staff reviewed the information provided in the above VEGP COL FSAR sections and finds that the applicant addressed the final configuration of the CWS as specified in the COL information item in Section 10.4.12.1 of the AP1000 DCD. The staff finds that the CWS design parameters of temperature and flow rates in VEGP COL FSAR Table 10.4-202 are consistent with the design parameters in AP1000 DCD Tier 2 Table 10.4.5-1. The staff also finds that the piping design pressures of the VEGP CWS are consistent with the design pressures of the conceptual (non-site-specific) design of the AP1000 CWS, and are acceptable.

Site-Specific Information Replacing Conceptual Design Information

- VEGP CDI

The applicant provided VEGP site-specific design information as part of the FSAR regarding the CWS. The applicant replaced bracketed text throughout Section 10.4.5 of the AP1000 DCD to provide VEGP-specific CWS power generation design basis component information, general CWS description, component description, system operation, tests and inspections, and instrumentation applications. The staff reviewed the additional text in VEGP CDIs throughout VEGP COL FSAR Section 10.4.5 of the CWS system, and the following is a summary of the staff's evaluation of the VEGP CDI.

IN VEGP 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 (TCS) heat exchangers and the condenser vacuum pump seal water heat exchangers under varying conditions of power plant loading and design weather conditions.

In VEGP COL FSAR Section 10.4.5.2.1, the applicant provided site-specific design information in that the VEGP CWS consists of three 33-1/3-percent capacity circulating water pumps, one

hyperbolic natural draft cooling tower (NDCT), and associated piping, valves, and instrumentation.

In VEGP COL FSAR Section 10.4.5.2.2, the applicant provided VEGP-specific design information regarding the CWS major components, such as; circulating water pumps, cooling tower, cooling tower makeup and blowdown, and piping and valves. The staff finds that VEGP CDI in Section 10.4.5.2.2 adequately addresses the final configuration of the VEGP CWS as specified in the COL information item in Section 10.4.12.1 of the AP1000 DCD.

The VEGP CWS consists of three vertical, wet pit, single-stage, mixed-flow pumps that are mounted in a pump pit, which is attached to the cooling tower basin. Each pump discharge line has a motor-operated butterfly valve located between the pump discharge and the main header, which permits isolation of one pump for maintenance and allows two-pump operation.

The VEGP cooling tower is designed to cool the water to 91°F with a hot water inlet temperature of 114.9°F, based on a design wet bulb temperature of 80°F (see VEGP COL FSAR Table 10.4-202 and Section 10.4.5.2.2). The staff finds that the above temperature values are acceptable as they demonstrate an equally effective cooling tower design as listed in AP1000 DCD, Tier 2, Table 10.4.5-1. The staff also finds that the NDCT is sufficiently far from the plant (1000 feet south) so that the potential of interactions with safety-related SSCs is mitigated.

The VEGP cooling tower makeup is provided by the RWS, which is described in VEGP 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 staff’s evaluation of the RWS is provided in SER Section 9.2.11.

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 makeup and blowdown. The CWS is designed to withstand the maximum operating discharge pressure of the circulating water pumps. As discussed earlier in the staff evaluation of VEGP COL 10.4-1, the staff finds the CWS piping design pressure of 115 psig to be consistent with the DCD value and, therefore, acceptable.

Regarding the flooding, in VEGP COL FSAR Section 10.4.5.2.3, “System Operation,” the applicant referenced the AP1000 DCD, where the staff finds that the effects of flooding due to a CWS failure, such as a rupture of an expansion joint, will not result in detrimental effects on safety-related SSCs, because the turbine building does not house safety-related equipment 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 to the equipment in the turbine building. Also, the site grading will carry the water away from safety-related buildings. Small CWS leaks in the turbine building will drain into the waste water system. Large CWS leaks due to pipe failures will be indicated in the control room by a loss of vacuum in the condenser shell. Therefore, the staff concludes that 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.

In VEGP 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 VEGP 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 VEGP CWS (VEGP CDI) provided in the VEGP 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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:

- VEGP 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.

- VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP COL FSAR Section 10.4.7.2.1, the applicant provided the following:

AP1000 COL Information Item

- VEGP COL 10.4-2

The applicant provided additional information in VEGP 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 VEGP 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 the FSER related to the DCD.

In addition, the regulatory basis for acceptance of the COL information item and STD SUP 10.4-2 is GDC 14, "Reactor Coolant Pressure Boundary," 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 are 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, "Evaluation of Water Hammer Occurrences in Nuclear Power Plants."

10.4.7.4 *Technical Evaluation*

The NRC staff reviewed Section 10.4.7 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 condensate and feedwater system. 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no confirmatory or open items related to the standard content in the BLN SER.

The staff reviewed the information in the VEGP COL FSAR:

AP1000 COL Information Item

- VEGP COL 10.4-2

In VEGP COL FSAR Section 10.4.7.2.1, the applicant provided additional information in VEGP 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 VEGP 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 methoxypropylamine. During shutdown conditions, carbohydrazide may be used in place of hydrazine.

The NRC staff reviewed the resolution to VEGP 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. The EPRI Guidelines indicates that carbohydrazide is an alternate oxygen scavenger that may be used during cold shutdown/wet layup of the SGs to alleviate personnel safety concerns caused by use of hydrazine for wet layup. Therefore, the staff finds the identified oxygen scavenger agents are consistent with the EPRI guidelines.

For pH control, the EPRI secondary water chemistry guidelines do not require specific amines; however, the staff notes that in accordance with Section 3.3.1 of the EPRI guidelines, the proposed amine, methoxyproplyamine has been used or is being used in PWR plants as a pH control agent. Section 3.3.1 of the EPRI Guidelines recommends a plant-specific amine be selected based on a number of factors. Section 3.3.1.2 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. In STD SUP 10.4-2, the applicant stated that oxygen scavenging and ammoniating agents are selected and utilized for plant secondary water chemistry optimization following the guidance of NEI 97-06, "Steam Generator Program Guidelines," and that the EPRI Pressurized Water Reactor Secondary Water Chemistry Guidelines are followed as described in NEI 97-06. The staff's evaluation of STD SUP 10.4-2 is discussed below.

The staff finds the pH control and oxygen scavenger chemical acceptable because, in accordance with STD SUP 10.4-2, the proposed chemicals will be qualified and the resulting pH optimized following the guidance of the EPRI PWR Secondary Water Chemistry Guidelines, which are endorsed in the standard review plan (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 methoxypropylamine, hydrazine, and carbohydrazide is acceptable.

The following portion of this technical evaluation section is reproduced from Section 10.4.7.4 of the BLN 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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:

- VEGP 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 endorsed by 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP COL application are documented in NUREG-1793 and its supplements.

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 Vogtle Electric Generating Plant (VEGP) Combined Operating 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.[6] 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 VEGP 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 11.2 of the AP1000 DCD, Revision 19, and Section 11.2.3 of the Vogtle Early Site Permit (ESP) Application Site Safety Analysis Report (SSAR), Revision *5*.

[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.

In addition, in VEGP 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 VEGP COL FSAR Section 11.2.1.2.5.2.

- STD COL 11.2-2

The applicant added additional information in STD COL 11.2-2 to resolve COL Information Item 11.2-2 (COL Action Item 11.2-2) regarding liquid radwaste cost-benefit analysis methodology.

- VEGP COL 11.2-2

The applicant provided additional information in VEGP 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 VEGP COL FSAR Sections 11.2.3.3 and 11.2.3.5.

- VEGP COL 2.4-5 and VEGP COL 15.7-1

VEGP COL FSAR Section 11.2 does not identify VEGP COL 2.4-5 and VEGP COL 15.7-1 as COL information items applicable to Section 11.2. However, VEGP COL 2.4-5 and VEGP 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, VEGP COL 2.4-5 and VEGP COL 15.7-1 are evaluated in SER Section 11.2.4. In VEGP COL FSAR Section 2.4, the applicant incorporated by reference VEGP ESP SSAR Section 2.4.13 to address COL Information Items 2.4-5 and 15.7-1.

- VEGP COL 11.5-3

The applicant provided additional information in VEGP 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 VEGP COL FSAR Section 11.2.3.5.

- VEGP ESP COL 2.4-1

The applicant added additional information to address VEGP Early Site Permit (ESP) COL 2.4-1 regarding the use of chelating agents.

Supplemental Information

- STD SUP 11.2-1

The applicant added in VEGP COL FSAR Section 11.2.3.6 supplemental information to address the quality assurance (QA) program to be applied to the LWMS.

- VEGP SUP 11.2-1

The applicant added supplemental information in VEGP COL FSAR Section 11.2.1.2.4 regarding the exterior radwaste discharge piping. On September 10, 2010, the applicant provided additional supplemental information regarding the exterior radwaste discharge piping.

- VEGP SUP 11.2-2

The applicant added supplemental information in VEGP COL FSAR Section 11.2.3 to address the liquid effluent site interface parameter.

11.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the FSER related to the DCD and the VEGP ESP.

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 50.34(a), “Design objectives for equipment to control releases of radioactive material in effluents—nuclear power reactors.”
- 10 CFR Part 50, Appendix A, 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), “Contents of applications; additional technical information”
- 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 VEGP COL FSAR and checked the referenced DCD and the VEGP ESP SSAR to ensure that the combination of the DCD, the VEGP ESP SSAR, 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 contained 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 VEGP COL application are documented in NUREG-1793 and its supplements and in NUREG-1923, "Safety Evaluation Report for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant (VEGP) ESP Site."

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

- VEGP COL 11.2-2, Cost-Benefit Analysis of Population Doses

- VEGP COL 2.4-5, Accidental Release of Liquid Effluents into Groundwater and Surface Water

- VEGP COL 15.7-1, Consequences of Tank Failure
- VEGP COL 11.5-3, Individual Dose Limits in 10 CFR Part 50, Appendix I
- VEGP ESP COL 2.4-1, Use of Chelating Agents
- STD SUP 11.2-1, Quality Assurance
- VEGP SUP 11.2-1, Supplemental Information on Exterior Radwaste Discharge Piping
- VEGP SUP 11.2-2, Supplemental Information on Liquid Effluent Site Interface Parameter

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 VEGP COL FSAR Section 11.2 met the regulatory requirements in the regulations stated above (safety evaluation report (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 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 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 with open items issued for the Bellefonte Nuclear Plant (BLN) Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1, to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs) and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no confirmatory items or open items to resolve.

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.

- VEGP COL 11.2-2

The applicant provided additional information in VEGP COL 11.2-2 to resolve COL Information Item 11.2-2. COL Information Item 11.2-2 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 in 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 of the VEGP 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 radioactive material from the liquid effluent, the resulting cost per dose reduction was $586,316 per total body person-rem and $5,063,636 per thyroid person-rem. This is well above the maximum costs criterion of $1,000 per person-rem for an augment in 10 CFR Part 50, Appendix I. Thus, the applicant concluded that the LWMS meets the as low as reasonably achievable (ALARA) requirements of 10 CFR Part 50, Appendix I, Section II.D, and requires no augments.

The NRC staff performed an independent assessment of the 50-mile population doses, considering the reasonableness of the modeling assumptions as provided by the applicant in VEGP ESP SSAR Tables 11.2-1 and 11.2-2 and the guidance in RG 1.110. The NRC staff concluded in NUREG-1923, Section 11.3.2, that the applicant's results represent conservative upper bound estimates for three reasons:

- First, the applicant assumed the drinking of Savannah River water when no such use has been shown to exist within 100 miles downstream of the site.

- Second, the applicant ignored the dilution flow from the plant discharge water.

- Third, the applicant used a low estimate of annual average river flow.

The staff's calculations, using the applicant's population dose values, support the applicant's position that the LWMS meets the cost-benefit design criterion of 10 CFR Part 50, Appendix I, Section II.D. As a result, RAI 11.2-1 is closed.

- VEGP COL 2.4-5 and VEGP COL 15.7-1

The applicant provided additional information in VEGP COL 2.4-5 and VEGP 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 in 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 in 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.

The applicant incorporated by reference Section 2.4.13 of the VEGP ESP SSAR to address accidental release of liquid effluents into ground and surface water. Based on the staff's review of Section 2.4.13, the staff issued RAI 2.4.13-1. RAI 2.4.13-1 notes that NUREG-0800 Section 2.4.13, under Acceptance Criterion No. 5, references BTP 11-6, which provides guidance in assessing potential release of radioactive liquids at the nearest potable water supply located in an unrestricted area for direct human consumption or indirectly through animals, crops, and food processing. BTP 11-6 provides further guidance concerning how 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).

RAI 2.4.13-1 also notes that the applicant's analysis did not include a discussion of pathways other than drinking water and that the analysis should discuss these other pathways, especially

the pathways, such as fish and crop irrigation that might result in concentration of the source term. RAI 2.4.13-1 requested the applicant to either discuss other pathways, or justify why it need not.

In a letter from Southern Nuclear Operating Company (SNC) to the NRC dated December 23, 2008, the applicant addressed RAI 2.4.13-1. The applicant's response provided justification for why other pathways did not need to be included in the analysis. In summary, its analysis concluded that tritium accounts for 99.99 percent of the total hypothetical radionuclide activity at the point of exit from the restricted area and, since tritium does not bioaccumulate in the environment, evaluation of secondary exposure pathways is not warranted. The staff reviewed the applicant's analysis and performed an independent evaluation (as presented below).

VEGP SER Table 11.2-1 presents the results of a conservative dose assessment assuming the drinking water and fish consumption exposure pathways for the surface water concentration for radionuclides in Mallard Pond within the restricted area. The radionuclide concentrations assumed are those as presented in VEGP ESP SSAR Table 2.4.13-5. The third column is the calculated dose for an individual consuming 730 liters per year drinking water from the pond; and the fourth column is the calculated dose for intake of 21 kg per year fish from the pond, assuming the pond activity levels remain at the calculated maximum for the year. (Intake quantities represent the maximally exposed individual (MEI) from RG 1.109.)

The applicable regulatory acceptance criterion for a liquid waste tank failure is that the postulated failure would not result in radionuclide concentrations in excess of 10 CFR Part 20, Appendix B, Table 2, Column 2, limits at the nearest source of potable water, where the radionuclide concentrations correspond to a calculated dose of 50 mrem per year from the drinking water pathway. As VEGP SER Table 11.2-1 shows, the conservatively calculated MEI dose for one year's exposure for the applicable exposure pathways (4.4 mrem from drinking water and 0.90 mrem fish consumption) is less than this corresponding 50 mrem dose criterion. Any actual exposures to members of the public would be a small fraction of the above, considering additional dilution from Mallard Pond to the unrestricted area, where the nearest municipal water user is more than 100 river miles downstream, as is indicated in VEGP ESP SSAR Table 2.4.1-9.

Based on the above evaluation and the applicant's response to RAI 2.4.13-1, the NRC staff finds potential doses to members of the public resulting from an accidental release of liquid effluents meet Acceptance Criterion #5 and the referenced BTP 11-6. Therefore, RAI 2.4.13-1 is closed.

- VEGP COL 11.5-3

The applicant provided additional information in VEGP COL 11.5-3 to resolve the COL applicant's responsibilities 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 in 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 incorporated by reference Section 11.2.3 of the VEGP ESP SSAR to address liquid radioactive releases and the methods used to assure that individual and estimated population doses are maintained ALARA in accordance with 10 CFR Part 50, Appendix I. Additionally, the applicant summarized the total body population dose within 50 miles of VEGP Units 3 and 4, as well as the corresponding thyroid dose due to liquid effluents.

The liquid effluent release parameters in VEGP ESP SSAR Tables 11.2-1, 11.2-2, and 11.2-3 were used by the applicant to calculate the annual liquid pathway doses to the MEI in VEGP ESP SSAR Table 11.2-4. The applicant compared these doses with the 10 CFR Part 50, Appendix I criteria in VEGP ESP SSAR Table 11.2-5. The NRC staff reviewed these calculated doses and found that they satisfied the MEI dose limits for liquid releases in 10 CFR Part 50, Appendix I, Section II.A, thereby demonstrating that the liquid radwaste system design is capable of maintaining doses within the design objectives of 10 CFR Part 50, Appendix I. The NRC staff performed an independent assessment and determined that the applicant's results represent conservative upper bound estimates.

The NRC staff concluded in NUREG-1923 that the applicant had provided a bounding assessment for liquid effluents demonstrating its capability to comply with the regulatory requirements in 10 CFR Part 20 and Appendix I to 10 CFR Part 50.

- VEGP ESP COL 2.4-1

This item is addressed in Section 2.4.13 of this 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.*

- VEGP SUP 11.2-1

The applicant provided additional information in VEGP SUP 11.2-1 related to the exterior radwaste discharge piping. This item is related to 10 CFR 20.1406 and is addressed in SER Section 12.3.

- VEGP SUP 11.2-2

The applicant stated that the only liquid effluent site interface parameter outside the Westinghouse scope is the release point to the Savannah River. The staff finds this statement true because the release point to the environment of liquid radioactive effluent is site-specific and to the Savannah River.

Demonstrating Compliance with 10 CFR 20.1301(e)

10 CFR 20.1301(e) requires that NRC-licensed facilities comply with the 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 VEGP ESP SSAR revealed that the applicant analyzed the above-discussed items and presented the results in SSAR Tables 11.2-6. The applicant's results included the sum of doses from the two proposed units and the two existing units at the site.

For the total site, the applicant's results are less than the maximum doses specified in 40 CFR 190.10(a) of 25 mrem/yr whole body, 75 mrem/yr thyroid, and 25 mrem/yr any other organ. Therefore, the NRC staff determined that the doses as analyzed by the applicant meet the requirements of 40 CFR Part 190 and 10 CFR 20.1301(e).

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 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 additional design features of the liquid effluent discharge pipe and operating programs in VEGP COL FSAR Section 11.2. The information in FSAR Section 11.2.1.2.4 describing the additional design features of the liquid effluent discharge pipe is evaluated in SER Section 12.3. The operational programs are evaluated in SER Section 12.5.

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 and the VEGP ESP SSAR. 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements and in NUREG-1923.

In addition, the staff evaluated the additional COL information (STD COL 11.2-1, STD COL 11.2-2, VEGP ESP COL 2.4-1, VEGP COL 11.2-2, VEGP COL 2.4-5, VEGP COL 15.7-1, VEGP COL 11.5-3, STD SUP 11.2-1, VEGP SUP 11.2-1, and VEGP SUP 11.2-2) 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 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 11.3 of the AP1000 DCD, Revision 19, and Section 11.3.3 of the VEGP ESP SSAR, Revision 5.

In addition, in VEGP COL FSAR Section 11.3, the applicant provided the following:

AP1000 COL Information Items

- STD COL 11.3-1

The applicant added 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.

- VEGP COL 11.3-1

The applicant provided additional information in VEGP 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 VEGP COL FSAR Section 11.3.3.4.

- VEGP COL 11.5-3

The applicant provided additional information in VEGP 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 VEGP COL FSAR Section 11.3.3.4.

Supplemental Information

- STD SUP 11.3-1

The applicant added supplemental information in VEGP 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 VEGP 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 the FSERs related to the DCD and the VEGP ESP.

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 50.34(a)
- 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
- Appendix I to 10 CFR Part 50, 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
- RG 1.109
- 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 applicable acceptance criteria are identified 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 VEGP COL FSAR and checked the referenced DCD and the VEGP ESP SSAR to ensure that the combination of the DCD, VEGP ESP SSAR, 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 contained 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 VEGP COL application are documented in NUREG-1793 and its supplements and in NUREG-1923.

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
- VEGP COL 11.3-1, Cost-Benefit Analysis of Population Doses
- VEGP 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 VEGP 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 contained 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1, to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no confirmatory items or open items to resolve.

AP1000 COL Information Items

- 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.

- VEGP COL 11.3-1

The applicant provided additional information in VEGP COL 11.3-1 to resolve COL Information Item 11.3-1. COL Information Item 11.3-1 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 in 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 VEGP COL FSAR and issued RAI 11.3-1 because the Nuclear Energy Institute (NEI) Template 07-11, "Generic Template Guidance for Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors," cited by SNC 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 VEGP 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. Assuming that this augment will eliminate all radioactivity from the gaseous effluent, the resulting cost per dose reduction was $7,022 per total body person-rem and $2,107 per thyroid person-rem. This is above the maximum cost criterion of $1,000 per person-rem for an augment in 10 CFR Part 50, Appendix I. Thus, the applicant concluded that the GWMS meets ALARA and requires no augments.

The NRC staff performed an independent assessment using the 50-mile population doses calculated by the staff (see following section) and the guidance in RG 1.110 and came to the same conclusion. The staff evaluated a different augment, the 1000 cubic-feet-per-minute Charcoal and High Efficiency Particulate Air (HEPA) filtration system; because this is the lowest cost augment that would effectively remove radioiodines and particulates, which are the major contributors to the population dose. VEGP SER Table 11.3-1 lists the cost-benefit ratios calculated by the applicant and staff and compares them to the Appendix I criterion. The NRC staff verified that Revision 2 of the VEGP COL FSAR adequately addresses the plant-specific cost-benefit analysis. The staff confirmed that the GWMS meets ALARA requirements and requires no augments. As a result, RAI 11.3-1 is closed.

- VEGP COL 11.5-3

The applicant provided additional information in VEGP 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 in 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 incorporated by reference Section 11.3.3 of the VEGP ESP SSAR to address gaseous radioactive releases. Additionally, the applicant summarized total body population dose within 50 miles of VEGP Units 3 and 4, as well as the corresponding thyroid dose due to gaseous effluents.

The applicant, in Section 11.3.3 of the VEGP ESP SSAR, discussed the methods used to assure that individual and estimated population doses are maintained ALARA in accordance with 10 CFR Part 50, Appendix I. The gaseous effluent release parameters in VEGP ESP SSAR Tables 11.3-1, 11.3-2, and 11.3-4 were used by the applicant to calculate the annual gaseous pathway doses to the MEIs in VEGP ESP SSAR Table 11.3-5. The applicant compared these doses with the 10 CFR Part 50, Appendix I criteria in VEGP ESP SSAR Table 11.3-6. The NRC staff performed an independent assessment of the population doses, considering the reasonableness of the modeling assumptions as provided by the applicant in VEGP ESP SSAR Tables 11.3-1, 11.3-2, and 11.3-4 and the guidance in RG 1.110 and achieved results similar to those of the applicant. The NRC staff concluded, in NUREG-1923, that the applicant's calculated doses are correct and appropriate. Based on its findings concerning the VEGP ESP SSAR, the NRC staff concluded that the VEGP COL FSAR provides a bounding assessment for gaseous effluents, demonstrating its capability to comply with the regulatory requirements in 10 CFR Part 20 and 10 CFR Part 50, Appendix I.

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.

- 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.

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 and the VEGP ESP SSAR. 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements and in NUREG-1923.

In addition, the staff evaluated the additional COL information (STD COL 11.3-1, VEGP COL 11.3-1, VEGP 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.

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 VEGP COL FSAR, Revision 5, incorporates by reference Section 11.4 of the AP1000 DCD, Revision 19.

In addition, in VEGP 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 for both wet and dry solid wastes.

- VEGP COL 11.4-1

The applicant provided additional information in VEGP COL FSAR Section 11.4.2.4.3 to address COL Information Item 11.4-1 (COL Action Item 11.4-1). The additional information describes options available for managing Class B and C low-level radioactive waste.

Supplemental Information

- VEGP SUP 11.4-1

The applicant provided supplemental information in VEGP COL FSAR Section 11.4.6.3 to address long-term onsite storage of radioactive waste.

- STD SUP 11.4-1

The applicant provided supplemental information in VEGP 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 VEGP COL FSAR Section 11.4.6.1.

License Condition

- Part 10, License Condition 3, Operational Program Implementation

VEGP COL FSAR Section 13.4, Table 13.4-201, "Operational Programs Required by NRC Regulations," identifies Item 9, the process control program, 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 process control program.

11.4.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the FSER related to the DCD.

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

The applicable acceptance criteria are identified in NUREG-0800, Section 11.4, including BTP 11-3.

11.4.4 Technical Evaluation

The NRC staff reviewed Section 11.4 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 contained 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 VEGP 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 Process Control Program
- VEGP COL 11.4-1, Alternatives for B and C Wastes
- VEGP SUP 11.4-1, Long Term On-Site Storage Facility
- 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 BLN 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1, to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.
- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is

identified in this SER by use of italicized, double-indented formatting. There was one confirmatory item (Confirmatory Item 11.4-1) and one open item (Open Item 11.4-1) related to the standard content in the BLN SER. The resolution of those items is addressed in this 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****.*

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 contained in VEGP COL 11.4-1 and VEGP SUP 11.4-1 and is evaluated below.

- VEGP COL 11.4-1

In a September 23, 2009, response to RAI 11.4-1 and RAI 11.4-2, the applicant provided additional information in VEGP COL 11.4-1 to address alternatives for interim storage of Class B and C low-level radioactive waste.

The applicant's revision of FSAR Section 11.4.2.4.3 specifies three options the applicant has to store Class B and C low-level radioactive waste without ever needing to construct additional onsite storage. These options include fully utilizing the present storage capacity of the AP1000 for Class B and C waste, using vendor services to store Class B and C waste offsite, and gaining access to storage facilities at another licensed nuclear plant. The staff has examined each of the potential options described by the applicant.

One of the options for waste storage is the prudent use of the AP1000 design. The applicant can extend the design storage capacity of the AP1000 capacity for Class B and C waste by prudently managing waste throughput. The applicant points out that Class B and C wastes are wet wastes and the AP1000 design has more than one year of storage capacity in the Auxiliary Building for this waste. In addition, the staff's own analysis of the capacity of the AP1000

Radwaste Building shows that the anticipated volume of Class B and C waste comprises less than 2 percent of the anticipated volume of all low-level radioactive waste. By frequently disposing of Class A waste, the AP1000 design can likely store at least 10 years' generation of Class B and C waste in the Radwaste Building. The staff concludes that, in combination with other options discussed in this section, this option could significantly postpone or possibly eliminate the need to design and build additional onsite storage for Class B and C waste.

Another option is to process and store Class B and C waste offsite by using vendor services. The applicant states that it has Waste Control Specialists (WCS) of Texas available for offsite storage. The staff also is aware of other commercial vendors of low-level waste management services, namely Studsvik facilities in Memphis and Erwin, Tennessee. Based on a review of the licenses for these facilities, the staff found that these facilities also are available to the applicant to process and store Class B and C waste. This option could both reduce the final volume of Class B and C waste and prolong the time before the applicant would need onsite storage.

Lastly, the applicant may gain access to a storage facility at another licensed nuclear plant. SNC is currently the licensed operator of Joseph M. Farley Nuclear Plant, Edwin I. Hatch Nuclear Plant, and VEGP Units 1 and 2. Currently, all three facilities either have additional onsite storage facilities or have plans to develop additional storage capacity. If the applicant ever required additional storage capacity, it could arrange for additional offsite storage with the three other facilities within the same operating company.

Based on the above three options presented in the application, the staff concludes that the applicant has provided reasonable assurance that it will have enough onsite and offsite contingent storage capacity for Class B and C low-level radioactive waste to eliminate, or at least significantly delay, the need to design and build additional onsite storage for Class B and C waste.

Supplemental Information

- VEGP SUP 11.4-1

In STD COL 11.4-1, the applicant states that, "no additional onsite radwaste storage is required beyond that described in the DCD." Additionally, VEGP SUP 11.4-1, addressed in VEGP FSAR Section 11.4.6.3, discusses the long-term onsite storage facility and briefly states that the applicant may use the planned VEGP Units 1 and 2 low-level radwaste storage facility should disposal facilities not be available.

Based on these statements by the applicant, the NRC issued two RAIs asking for more information concerning long-term storage of low-level radioactive waste.

In a September 23, 2009, response to RAI 11.4-1 and RAI 11.4-2, the applicant explained that, should it need additional onsite storage of Class B and C low-level radioactive waste, it could construct an additional onsite storage facility.

The applicant explained how it could expand onsite storage capacity. The applicant discussed design and operational issues needed to safely store the waste and comply with 10 CFR Parts 20 and 50 in FSAR Section 11.4.6.3.

The staff considers the applicant's response adequate given the large uncertainties in the situation. Currently, it is impossible to predict the volume of Class B and C waste that the applicant might need to store onsite. Given the options discussed above, one could reasonably assume this volume to be within the capacity of the design and the applicant would not have the need for additional onsite storage. The applicant did provide a reasonable response by specifying the design objectives and operating considerations for an onsite storage facility consistent with NRC guidance and good radioactive waste management practices.

The staff reviewed the applicant's plans for increasing onsite storage and determined that the applicant would be able to comply with the applicable requirements in 10 CFR Part 20 and 10 CFR Part 50 concerning occupational and public exposures, ALARA programs, and radiological monitoring for onsite and offsite exposures and releases.

Based on the independent analysis and safety review, the NRC staff concludes that the applicant has provided sufficient information to demonstrate that it could safely handle and store any low-level radioactive waste that might accumulate due to any potential unavailability of permanent disposal. The staff considers RAI 11.4-1, RAI 11.4-2, and Open Item 11.4-1 resolved.

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 proposes to include the following two license conditions:

- 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff evaluated the additional COL information (STD COL 11.4-1, VEGP COL 11.4-1, STD SUP 11.4-1, and VEGP 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, Confirmatory Item 11.4-1, and Open Item 11.4-1 related to VEGP 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; 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 11.5 of the AP1000 DCD, Revision 19.

In addition, in VEGP 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 Offsite Dose Calculation Manual (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.

- VEGP COL 11.5-2

The applicant provided additional information in VEGP COL 11.5-2 to add language to VEGP COL FSAR Section 11.5.3 addressing extension of the existing SNC program for QA of radioactive effluent and environmental monitoring to apply to VEGP Units 3 and 4.

- VEGP COL 11.5-3

The applicant provided additional information in VEGP 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 Condition

- Part 10, License Condition 3, Operational Program Implementation, Item G.3

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 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 Offsite Dose Calculation Manual, and the Radiological Environmental Monitoring program.

11.5.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the FSER related to the DCD.

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 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 are identified in NUREG-0800, Section 11.5.

11.5.4 Technical Evaluation

The NRC staff reviewed Section 11.5 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 contained 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 VEGP COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information contained in the VEGP 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

- VEGP COL 11.5-2 adds language to VEGP COL FSAR Section 11.5.3 addressing extension of the existing SNC program for quality assurance of radioactive effluent and environmental monitoring to apply to VEGP Units 3 and 4.

- VEGP 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 VEGP 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 (RETS)/SREC, ODCM and Radiological Environmental Monitoring Program (REMP) 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1, to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was one confirmatory item (Confirmatory Item 11.5-1) related to the standard content in the BLN SER. Its resolution is addressed in this 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.*

Resolution of Standard Content Confirmatory Item 11.5-1

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.

- VEGP COL 11.5-2

In VEGP COL 11.5-2, the applicant extended the existing, NRC-approved SNC QA program, including RG 4.15, Revision 1, for effluent and environmental monitoring to Units 3 and 4. By using the current program, the applicant will also avoid confusion and the potential for error because the program for the existing and planned units will share the same equipment and personnel. The staff finds this acceptable.

- VEGP COL 11.5-3

The applicant provided additional information in VEGP COL 11.5-3 to resolve COL Information Item 11.5-3. COL Information Item 11.5-3 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 VEGP COL FSAR Sections 11.2.3.5 and 11.3.3.4 for liquid and gaseous effluents, respectively.

The NRC staff reviewed the resolution of VEGP 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 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.*

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 proposes to include the following two license conditions:

- 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP 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, VEGP COL 11.5-2, and VEGP 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 and Confirmatory Item 11.5-1 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 is 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. Estimated Radionuclide Concentrations in Mallard Pond and Corresponding Estimated Doses

Radionuclide	Surface Water Concentration in Mallard Pond [C][1] (pCi/liter)	Total Body Dose Conversion Factor [DCF][2] (mrem/pCi)	Dose from drinking water from Mallard Pond for 1 year [DW][3] (mrem)	Bio-accumulation Factor [BF][4] (pCi/kg per pCi/liter)	Dose from consumption of fish from Mallard Pond for 1 year [DF][5] (mrem)
H-3	5.76E+4	1.05 E-7	4.4	9.0E-1	0.14
Mn-54	2.49E-1	8.72E-7	1.6E-4	4.0E+2	1.8E-3
Fe-55	7.52E+0	4.43E-7	2.4E-3	1.0E+2	7E-3
I-129	6.04E-4	9.21E-6	4.1E-6	1.5E+1	7.8E-6
Sr-90	4.21E-4	1.86E-3	5.7E-4	3.0E+1	4.9E-4
Ag-110m	1.82E-2	8.79E-8	1.2E-6	2.3E+0	7.7E-8
Cs-137	2.58E-1	7.14E-5	1.3E-2	2.0E+3	7.7E-1
Ce-144	1.23E-2	2.62E-8	2.4E-7	1.0E+0	6.8E-9
Total			4.4		0.90

1) Surface water concentrations from VEGP ESP SSAR, Table 2.4.13-5.
2) Ingestion dose conversion factors for adults from RG 1.109, Table E-11, except for DCF for I-129, which is from NUREG-0172, Table 4.
3) DW = C x DCF x 730 liters/year. The 730 liters/year is the amount of drinking water consumed by an adult maximally exposed individual (from RG 1.109, Table E-5).
4) Bioaccumulation factors for freshwater fish from RG 1.109, Table A-1, except for Ag-110m, which is from ORNL-4992, Table 4.12A (Reference 8 of RG 1.109, Appendix A).
5) DF = C x DCF x BF x 21 kg/year. The 21 kg/year of fish consumption is the amount consumed by an adult maximally exposed individual (from RG 1.109, Table A-1).

Table 11.3-1. Comparison of Cost-Benefit Ratios ($ per Person-Rem)

Organ/Body	Application	NRC Staff's Analysis	Maximum Cost-Benefit Ratio in 10 CFR Part 50 Appendix I
Total Body	7,022	8,419	1,000
Thyroid	2,107	2,526	1,000

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 Vogtle Electric Generating Plant (VEGP) combined license (COL) Final Safety Analysis Report (FSAR).

12.1.2 Summary of Application

Section 12.1 of the VEGP COL FSAR, Revision 5, incorporates by reference Section 12.1 of the AP1000 Design Control Document (DCD), Revision 19.

In addition, in VEGP COL FSAR Section 12.1, the applicant provided the following:

AP1000 COL Information Item

- 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)," Revision 0, into VEGP COL FSAR Section 12.1 and NEI 07-03A, "Generic FSAR Template Guidance for Radiation Protection Program Description," in Appendix 12AA.

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."

In addition, the acceptance criteria associated with the relevant requirements of Commission regulations for ALARA are given in Section 12.1 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants."

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, "Radiation protection programs"
- 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 ALARA," Revision 3
- RG 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures ALARA," 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 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.[7] 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

[7] 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 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 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 with open items issued for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs) and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was a confirmatory item (Confirmatory Item 12.1-1) and an open item (Open Item 12.1-1) related to the standard content in the BLN SER. The resolutions are addressed in this 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 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.

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

Since Open Item 12.1-1 and Confirmatory Item 12.1-1 have been resolved, the staff concludes that the relevant information presented in the VEGP 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 has incorporated approved references NEI 07-03A and NEI 07-08A into the VEGP FSAR and has demonstrated conformance with 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 acknowledged as 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 12.2 of the AP1000 DCD, Revision 19.

In addition, in VEGP 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 the FSER related to the DCD.

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," General Design Criterion (GDC) 61, "Fuel Storage and Handling and Radioactivity Control"

12.2.4 Technical Evaluation

The NRC staff reviewed Section 12.2 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 radiation sources. 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was a confirmatory item (Confirmatory Item 12.1-1) related to the standard content in the BLN SER. Its resolution is addressed in this 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.

Resolution of Standard Content Confirmatory Item 12.1-1

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP 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 VEGP 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 VEGP FSAR and has demonstrated conformance with 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 both RG 1.206 and 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 12.3 of the AP1000 DCD, Revision 19.

In addition, in VEGP COL FSAR Section 12.3, the applicant provided the following:

Tier 2 Departure

- VEGP DEP 18.8-1

The applicant described the following Tier 2 departure (DEP) from the AP1000 DCD. The applicant proposed revising several DCD figures in Section 12.3 to reflect the relocation of the Operations Support Center (OSC). This Tier 2 departure is evaluated in Section 12.5 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.

In Section 11.2.4 of this SER, the staff states that the following item in VEGP COL FSAR Section 11.2 is evaluated in this SER section:

Supplemental Information

- VEGP SUP 11.2-1

The applicant provided supplemental information in VEGP COL FSAR Section 11.2.1.2.4 regarding the exterior radwaste discharge piping. This item is addressed by the staff as part of its evaluation of STD COL 12.3-3.

12.3.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the FSER related to the DCD.

In addition, the acceptance criteria associated with the relevant requirements of Commission regulations for 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

- 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

- RG 8.2, “Guide for Administrative Practices in Radiation Monitoring”

- RG 8.8

- RG 8.10

- 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, “Measuring Radioactive Materials in Liquid and Gaseous Effluents and Solid Waste,” Appendix A

- RG 1.97

The applicable regulatory requirements and guidance for STD COL 12.3-3, STD COL 12.3-4, and VEGP SUP 11.2-1 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 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 radiation protection design features. 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.

The staff's review of this application included the following COL information and supplementary items:

- 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
- VEGP SUP 11.2-1, Supplemental Information on 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.
- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were two confirmatory items (Confirmatory Items 12.1-1 and 12.3-1) and one open item (Open Item 12.3-1) related to the standard content in the BLN SER. The resolutions are addressed in this 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.

Correction of Errors in the Standard Content Evaluation Text

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.

Resolution of Standard Content Confirmatory Item 12.1-1

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****.*

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.

Supplemental Information

- VEGP SUP 11.2-1

In Section 11.2.4 of this SER, the staff states that VEGP SUP 11.2-1 is evaluated in SER Section 12.3. The applicant added additional information in VEGP COL FSAR Section 11.2.1.2.4 regarding the exterior radwaste discharge piping.

The last paragraph of the standard content evaluation, reproduced from Section 12.3.4 of the BLN SER above, provides the staff's evaluation of the exterior radwaste discharge piping. The VEGP applicant has endorsed the December 16, 2008, supplemental response to RAI 12.3-12.4-1, stating that, while the response is expected to be standard, it includes both standard and plant-specific changes. The plant-specific changes are addressed by VEGP SUP 11.2-1. The plant-specific information provided by the VEGP applicant in VEGP FSAR Section 11.2, in conjunction with the resolution of Standard Content Confirmatory Item 12.3-1, demonstrates that the design of the exterior monitored liquid effluent discharge pipe is in compliance with 10 CFR 20.1406.

Staff Evaluation of Additional Supplemental Information Related to VEGP SUP 11.2-1

In a letter dated September 10, 2010, the applicant proposed to add supplemental information (VEGP SUP 11.2-1) at the end of VEGP COL FSAR Section 11.2.1.2.4 regarding the design of both the liquid radwaste system (WLS) discharge piping exiting the Radwaste Building and the waste water system (WWS) plant outfall pipe running to the plant outfall on the Savannah River. In the proposed supplemental information, the applicant stated that the WLS discharge piping from the Units 3 and 4 Radwaste Building would be stainless steel, enclosed within a guard pipe, and monitored for leakage to comply with 10 CFR 20.1406. The WWS blowdown line to the plant outfall at the Savannah River 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 3 and 4 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 groundwater monitoring program to ensure timely detection of inadvertent radiological releases to the groundwater. On the basis that VEGP 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 would implement a groundwater monitoring program for the WWS blowdown line piping running to the plant outfall at the Savannah River, 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 VEGP SUP 11.2-1 complies with the requirements of 10 CFR 20.1406 and is, therefore, acceptable. The staff confirmed that the applicant incorporated the proposed supplemental information into the VEGP COL FSAR.

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****.*

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 radiation protection design features and there is no outstanding information expected to be addressed in the VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

Since Open Item 12.3-1 and Confirmatory Items 12.1-1 and 12.3-1 have been resolved, the staff concludes that the relevant information presented in the VEGP COL FSAR is acceptable based on the relevant acceptance criteria 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 VEGP FSAR and has demonstrated conformance with 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, which addresses the groundwater monitoring program beyond the normal radioactive effluent monitoring program, is acceptable because the applicant has incorporated the approved reference NEI 08-08A into the VEGP FSAR and has demonstrated conformance 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 VEGP FSAR and has demonstrated conformance with the applicable regulatory requirements and guidance specified in Sections 12.3.3 and 12.3.4 of this SER.

- VEGP SUP 11.2-1 and the associated DCD related to the description of the monitored radwaste discharge pipeline are acceptable because the plant-specific information provided by the VEGP applicant in VEGP FSAR Section 11.2, in conjunction with the resolution of Standard Content Confirmatory Item 12.3-1, demonstrates that the design of the exterior monitored liquid effluent discharge pipe is in compliance with 10 CFR 20.1406.

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).

12.4.2 Summary of Application

Section 12.4 of the VEGP COL FSAR, Revision 5, incorporates by reference Section 12.4 of the AP1000 DCD, Revision 19.

In addition, in VEGP COL FSAR Section 12.4, the applicant provided the following:

Supplemental Information

- VEGP 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 the FSER related to the DCD.

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 VEGP 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 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 dose assessment. 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.

The staff reviewed the information in the VEGP COL FSAR:

Supplemental Information

- VEGP SUP 12.4-1

The applicant provided supplemental information regarding the dose to construction workers in VEGP COL FSAR Section 12.4.1.9 (Sections 12.4.1.9.1 through 12.4.1.9.4), "Radiation Exposure to Construction Workers." Section 12.4.1.9.1 briefly describes the site layout as depicted in Figure 1.1-202 of the VEGP FSAR. The sources of radiation exposure are described in Section 12.4.1.9.2 and include the sources of direct exposure (Units 1 and 2 as well as an anticipated but yet to be proposed independent spent fuel storage installation [ISFSI]), the gaseous effluent releases and the small amounts of liquid effluents released into the Savannah River. Section 12.4.1.9.3 includes the calculations for annual total exposure rates, and Section 12.4.1.9.4 includes the calculations for actual exposure that a construction worker may receive. The applicant also added a new Section 12.4.4, "References," which includes reference to the Southern Nuclear Operating Company's VEGP Annual Radioactive Effluent Release Reports for years 2001 through 2003 and to the Offsite Dose Calculation Manual (ODCM).

In VEGP COL FSAR Sections 12.4.1.9.2.1 through 12.4.1.9.2.3, the applicant identified the sources of radiation that could be encountered by VEGP Units 3 and 4 construction workers. The information provided by the applicant includes the direct radiation sources and the sources and activity estimates of gaseous and liquid effluent releases.

In VEGP COL FSAR Section 12.4.1.9.3.1, the applicant evaluated the potential direct radiological dose impacts to construction workers at VEGP Units 3 and 4 resulting from the operation of VEGP Units 1 and 2. The applicant stated that the average 365-day dose from the six thermoluminescent dosimeters (TLDs) located on the Protected Area Fence closest to the construction area is 115.9 millirem (mrem). Their stated annual average background dose is 49 mrem. These two values are then used to arrive at an annual dose of 66.9 mrem per year (115.9 mrem minus 49 mrem), direct exposure, from VEGP Units 1 and 2. The assumed exposure contribution from the anticipated ISFSI is negligible. Unit 4 construction workers may receive higher exposure than Unit 3 construction workers, due to exposure from an operating Unit 3 reactor. Therefore, the total annual direct exposure component is increased by an additional 33.5 mrem (the approximate annual exposure from one operating VEGP unit) to a total of 100.4 mrem per year of continuous exposure for VEGP Unit 4 construction workers.

The staff has determined that the use of the average annual exposure of Protected Area Fence TLDs is an acceptable method for conservatively determining dose to construction workers who will not enter the VEGP Unit 1 or Unit 2 protected areas. Since Units 1 and 2 are closer to these TLDs than to where the construction workers would be, the TLD data conservatively approximate the dose to construction workers. The staff issued RAI 12.3-12.4-1 to obtain further information concerning the acceptability of the TLD data that were used for the calculations in this section. The staff also issued RAI 12.3-12.4-2 to obtain further information to support the conclusions for the direct radiation component of the construction worker dose as a result of Unit 3 operation and a proposed ISFSI. The additional information is evaluated in the

section below. Since NUREG-1872, “Final Environmental Impact Statement for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site,” identified that TLDs placed at control locations approximately 10 miles from the VEGP site measured annual radiation exposures from 48.4 to 54.4 milliRad per year, the assumption of 49 mrem per year for background exposure is an acceptable approximation.

In VEGP COL FSAR Sections 12.4.1.9.3.2 and 12.4.1.9.3.3, the applicant discussed the potential radiological exposure from gaseous and liquid effluents to construction workers. The applicant assumed that the onsite construction worker would receive doses from these effluents as modeled for the offsite maximally exposed individual (MEI). The applicant used the codes XOQDOQ and GASPAR II to determine doses as a result of gaseous effluents, and used the Annual Radioactive Effluent Release Reports and the LADTAP code to determine doses resulting from liquid effluents. The applicant calculated the total body doses and maximally exposed organ and dose for each pathway.

VEGP COL FSAR Section 12.4.1.9.4, “Construction Worker Doses,” provides the assumptions used to calculate doses. This section includes the measured and calculated values used as a basis for each pathway that are used to provide estimates of total dose. The staff adjusted the annual doses for continuous exposure, as listed in Section 12.4.1.9.3, to reflect annual doses resulting from 2000 hours of assumed exposure. This results in a calculated 24.1 mrem total effective dose equivalent (TEDE) in a year.

VEGP COL FSAR Section 12.4.1.9.4.4 refers to tables at the end of the section for summaries of the annual exposures received by construction workers. Table 12.4-201 reflects gaseous effluent doses that would be received during a year of continuous exposure, not in the assumed 2000 hours. The other doses in the table, for direct radiation and liquid effluents, are for 2000 hours of exposure. This inconsistency in methodology results in a conservative reporting of the annual dose, and is considered acceptable.

Even though the liquid effluent dose assessment is not considered applicable for the calculation to the construction worker, as discussed below in the evaluation of the applicant’s response to RAI 12.3-12.4-3, its inclusion by the applicant in the overall dose to a construction worker adds conservatism to the assessment. The staff found all assumptions listed in VEGP COL FSAR Section 12.4.1.9 to be acceptable in providing a reasonable assessment of the construction worker dose since they are based on measured and calculated values for the existing facility.

The applicant provides in VEGP COL FSAR Table 12.4-203 a comparison for the members of the public dose assessment with environmental dose standards of 40 CFR Part 190. Most of the dose listed in the table (95 percent) is due to direct exposure from the facilities to the onsite construction workers rather than from radioactive materials introduced into the environment. The inclusion of the direct dose component when assessing compliance with 40 CFR Part 190 provides a conservative assessment. As stated in 40 CFR Part 190:

> The provisions of this part apply to radiation doses received by members of the public in the general environment and to radioactive materials introduced into the general environment as the result of operations which are part of a nuclear fuel cycle.

If access to the site and the construction area for Units 3 and 4 are controlled by the applicant, these areas would not be considered the general environment for purposes of 40 CFR Part 190 compliance; therefore, the staff concluded an assessment that demonstrates compliance with 40 CFR Part 190 for these areas results in a conservative evaluation.

The applicant states that, during construction of Units 3 and 4, the annual dose to construction workers would be less than the limit for members of the public as stated in 10 CFR 20.1301 and less than the environmental dose standard of 40 CFR Part 190. As a result, the staff can conclude that the construction workers would not be classified as radiation workers.

As a result of the staff's review of Section 12.4.1.9, three RAIs were issued, RAI 12.3-12.4-1, RAI 12.3-12.4-2 and RAI 12.3-12.4-3. Each RAI is discussed below:

RAI 12.3-12.4-1:

> In RAI 12.3-12.4-1, the staff questioned the adequacy of using a 2-year data set of TLD results for determining construction worker dose because the applicant provided no basis or evaluation to show that the 2-year data set was representative of the average annual dose that could be received by a worker for the Units 3 and 4 construction. In a letter dated January 16, 2009, the applicant responded to the RAI. The applicant stated that the TLD data from 2003 was used because it was the most complete at the time the ESP application was submitted. In addition, the data set from 2003 was believed to be representative because the plant capacity factor was 95 percent for that year. Further, the applicant stated that evaluations of more recent TLD data from 2006 yield similar results to the 2003 TLD data. The staff found this approach reasonable and acceptable. Over the long period of construction, the average capacity factor would likely be less than 95 percent and, as a result, the TLD data should provide a conservative estimate of construction worker direct dose. It should be noted that the TLD measurements would include the direct dose component from gaseous effluents; however, the applicant assessed this contribution separately, as discussed below, which had the effect of increasing the estimated dose to construction workers and resulted in a more conservative assessment result.
>
> RAI 12.3-12.4-1 also requested that the applicant provide error bounds for the estimated doses based on the TLD measurements. The applicant did not address the issue other than by stating that the 2003 and 2006 data were similar and that the TLD data are evaluated by a dosimetry processor in accordance with 10 CFR 20.1501(c). For the six TLD stations, the data for 2006 indicate an annual gross measurement (before background is subtracted out) between 111 mrem and 120 mrem, with an average of 115 mrem. Given that Units 1 and 2 are closer to the TLD locations than to where Unit 3 or 4 construction workers would be, the staff concluded that the potential error in measurement is offset by the additional conservatism in the location of the TLDs. The staff questioned the applicant's reference to 10 CFR 20.1501(c) for the dosimeter processing since this regulation is specific to the processing of personnel dosimeters, not environmental dosimeters where guidance is provided in RG 4.13, "Performance, Testing, and Procedural Specifications for Thermoluminescence Dosimetry: Environmental Applications," Revision 1 and the referenced ANSI N545 (1975), "Performance, Testing, and Procedural Specification for TLD, Environmental Application." In a supplemental response dated November 20, 2009, the applicant removed the reference to 10 CFR 20.1501(c). In a second supplemental response dated January 29, 2010, the applicant stated that the TLDs will be processed and

evaluated according to the vendor's internal quality control program, procedures, and RG 4.13. The staff concluded that the information provided in response to RAI 12.3-12.4-1 is acceptable.

RAI 12.3-12.4-2:

The annual dose to construction workers working at Unit 4 is based on an assumption that Unit 3 produces an annual exposure equal to one-half of the dose from Units 1 and 2 (33.5 mrem) and then adding to this the total contribution from Units 1 and 2 of 66.9 mrem, yielding a total direct dose of 100.4 mrem per year of continuous exposure. In RAI 12.3-12.4-2, the staff questioned why the dose from Unit 3 to Unit 4 construction workers would be one-half of that from Units 1 and 2. In a letter dated January 16, 2009, the applicant responded to the RAI. The applicant stated that for Unit 3, the direct radiation exposure from containment and other plant buildings is negligible, in accordance with DCD Section 12.4.2. The applicant conservatively assumed a dose from Unit 3 to Unit 4 construction workers to be one-half that from Units 1 and 2 combined.

The COL applicant also stated that the direct radiation exposure to VEGP Unit 3 and Unit 4 construction workers is negligible from the anticipated VEGP onsite ISFSI. In RAI 12.3-12.4-2, the staff also asked the applicant to describe the basis used for estimating the dose contribution from the proposed ISFSI. According to the applicant's initial response to RAI 12.3-12.4-2, dated January 16, 2009, the ISFSI was planned to be constructed west of Unit 2 at a distance of approximately 300 feet (ft) from the Units 3 and 4 construction areas, resulting in construction worker exposures of 15 mrem per year. A supplemental response to this RAI, dated November 20, 2009, indicated that the planned location of the ISFSI had changed to east of VEGP Unit 1, which is more than 1,000 ft from the proposed VEGP Unit 3 and Unit 4. ISFSI exposure assessments were evaluated as part of the VEGP ESP, where it was concluded that the contributions to doses from the ISFSI at distances greater than 600 ft were negligible. The assumed location for the VEGP ISFSI, east of Unit 1, ensures that the Unit 3 and Unit 4 construction workers will be significantly further than 600 ft away from the installed ISFSI. A second supplemental response to this RAI, dated January 29, 2010, clarified some aspects of this ISFSI exposure assessment by identifying certain TLD results as representing background dose and referencing the response to the Environmental Report RAI E4.5.3-1 for further information. The staff has concluded that potential doses to construction workers from an anticipated ISFSI would be negligible based on the above assumptions.

Based on the above information, the staff agrees that assumptions and conclusions made by the applicant regarding construction worker exposures from direct radiation from Unit 3 and a proposed ISFSI are conservative and acceptable. Therefore, the response to RAI 12.3-12.4-2 is acceptable.

RAI 12.3-12.4-3, Items a, b and c:

Items a and b of RAI 12.3-12.4-3 requested additional information on the following two topics:

- The gaseous effluent exposure to construction workers was calculated using ODCM methodologies. Construction workers would be located within the site boundary, closer than normally calculated by the ODCM. Additional information was requested to confirm that the calculated doses are conservative.

- The liquid effluent calculations for construction workers used the same assumptions as those for offsite members of the public, and neglected to include any exposure for construction workers as a result of the interconnects between Unit 3 and Unit 4.

In a letter dated January 16, 2009, the applicant responded to the RAI. In summary, the applicant stated the following:

- For gaseous effluents, in the applicant's calculation the direction of maximum exposure to Unit 3 construction workers from Units 1 and 2 releases was 0.36 miles to the west-southwest, and 0.52 miles to the west for Units 1 and 2 releases to Unit 4 construction workers. The exposed Unit 4 construction workers from Unit 3 were taken to be 0.15 miles in the direction of maximum exposure. All releases and receptors were modeled as ground-level with no shielding. The source term was based on data for 2002, which was the maximum calculated dose year among the years 2001-2004. The annual total body dose to construction workers from gaseous effluents calculated by the applicant is summarized in VEGP COL FSAR Table 12.4-201 as 0.81 mrem. The staff determined that the directions and distances described above correctly model the actual distances, that ground-level modeling is conservative, and that the 0.81 mrem per year is consistent with the results presented in NUREG-1872, Appendix G, Table G-5, which describes the exclusion area boundary dose to the total body as 0.56 mrem per year.

- For liquid effluents, the applicant assumed the dose to construction workers would be equal to that of the MEI, as defined in 10 CFR Part 50, 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." The MEI is assumed to obtain drinking water and fish for consumption downstream of the liquid effluent release. The staff concluded that this is conservative because, in reality, the source of construction worker onsite drinking water is not from the river.

- Unit 3 and Unit 4 each has a dedicated liquid radwaste line that interconnect only at the outfall. Workers trained in the appropriate radiological controls will perform the required fit-up and construction. Operating procedures, radiation controls, and training would be used to control exposure when the interconnect is made.

The staff concluded that the information provided in response to RAI 12.3-12.4-3, Items a and b, as summarized in the above three bullets, is acceptable.

Item c of RAI 12.3-12.4-3 requested additional information with regard to the statement that dose calculations for construction workers from particulates are limited to those with half-lives greater than 8 days. The 8-day half-life is a 10 CFR Part 50, Appendix I criterion and is not

applicable to dose calculations for construction workers. In the letter dated January 16, 2009, the COL applicant responded to the RAI. The applicant stated that because of in-plant control measures, e.g., system holdups such as gaseous and solid waste storage (decay) tanks, short-lived (half-life less than 8 days) radionuclides are insignificant contributors to exposure. The applicant also stated that gaseous releases are typically five orders of magnitude less than applicable limits. The staff reviewed the applicant's response and several of the VEGP Annual Radiological Environmental Operating Reports and determined that, while the issue of disregarding radionuclides with half-lives less than 8 days should not be excluded from this assessment, the contribution would be negligible. The applicant's reports do indicate that the dose to construction workers from gaseous effluents would be negligible, and suggest that the estimated doses excluding the radionuclides with half-lives less than 8 days is reasonable and conservative. The staff concluded that the applicant's response to Item c of RAI 12.3-12.4-3 is acceptable.

In summary, the NRC staff determined that the information provided in VEGP SUP 12.4-1, regarding dose to construction workers, in the new Section 12.4.1.9, was acceptable. In accordance with the discussion in the above paragraphs, RAIs 12.3-12.4-1, 12.3-12.4-2, and 12.3-12.4-3 are resolved.

- 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 the dose assessment, and there is no outstanding information expected to be addressed in the VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP COL FSAR is acceptable based on the relevant acceptance criteria provided in Section 12.4 of NUREG-0800. The staff based its conclusion on the following:

- VEGP SUP 12.4-1, which provides supplemental information to address dose to construction workers, is acceptable, because the applicant has demonstrated compliance with 10 CFR 20.1101, 10 CFR 20.1301, and 10 CFR 20.1302.

- 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 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 health physics (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 VEGP COL FSAR, Revision 5, incorporates by reference Section 12.5 of the AP1000 DCD, Revision 19.

In addition, in VEGP COL FSAR Section 12.5, the applicant provided the following:

Tier 2 Departure

- VEGP DEP 18.8-1

The applicant described the following Tier 2 departure from the AP1000 DCD. The applicant proposed revising the first sentence of AP1000 DCD Section 12.5.2.2, "Facilities," to state that the ALARA briefing room is located off the main corridor immediately beyond the main entry to the annex building. This change eliminates the DCD reference to the OSC being in that location. The applicant also proposed revising several DCD figures in FSAR Section 12.3 to reflect the relocation of 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 the FSER related to the DCD.

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 and VEGP 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 Gieger-Muller Counters"
- RG 8.8
- RG 8.9
- RG 8.10
- 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 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 HP facilities design. 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were two confirmatory items (Confirmatory Items 12.1-1 and 12.5-1) related to the standard content in the BLN SER. The resolutions are addressed in this SER.

The staff reviewed the information in the VEGP COL FSAR:

Tier 2 Departure

- VEGP DEP 18.8-1

The applicant revised the first sentence of DCD Section 12.5.2.2 to read: "The ALARA briefing room is located off the main corridor immediately beyond the main entry to the annex building." This change results in a relocation of the stated location for the OSC. As reported in VEGP COL FSAR Section 12.3, this departure also results in replacing DCD Figure 12.3-1 (Sheet 11), DCD Figure 12.3-2 (Sheet 11) and DCD Figure 12.3-3 (Sheet 11) with VEGP COL FSAR Figure 12.3-201, Figure 12.3-202 and Figure 12.3-203, respectively. In addition, DCD Figure 9A-3 (Sheet 1) is replaced with VEGP COL FSAR Figure 9A-201 to reflect the relocation of the OSC. The staff's evaluation of this departure is found in Chapters 13 and 18 of this SER.

This departure does not have an impact on the radiation protection facilities design. Since the ALARA briefing room remains as stated in the DCD, there is no impact on radiation protection facilities, programs or functions. The location of the ALARA briefing room would allow for efficient and timely briefings and meets the requirements of RGs 8.8 and 8.10.

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 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.

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.

License Condition

- *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****.*

Resolution of Standard Content Confirmatory Item 12.5-1

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 proposes to include the following license conditions:

- 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 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 HP facilities design, and there is no outstanding information expected to be addressed in the VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information, related to the reference in ANSI N13.27-1981, presented in the VEGP COL FSAR is acceptable. The staff based its conclusion on the following:

- VEGP DEP 18.1-1, which addresses the relocation of the stated location in the DCD for the OSC, is acceptable because this departure does not have an impact on the radiation protection facilities design. Since the ALARA briefing room remains as stated in the DCD, there would be no impact on radiation protection facilities, programs or functions. The location of the ALARA briefing room would allow for efficient and timely briefings, and meet the requirements of RGs 8.8 and 8.10.

- 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 Vogtle Electric Generating Plant (VEGP) 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 VEGP COL FSAR Section 13.1, the applicant provided the following:

AP1000 COL Information Items

- VEGP COL 13.1-1

The applicant provided additional information in VEGP 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. VEGP COL 13.1-1 describes organizational positions of the nuclear power station and owner/applicant corporations and associated functions and responsibilities.

- VEGP COL 9.5-1

The applicant provided additional information in VEGP COL 9.5-1, describing the fire protection program in Section 9.5.1.8. For this VEGP COL item, the applicant added a new Section 13.1.1.2.10, "Fire Protection." Table 1.8-202, "COL Item Tabulation," provides VEGP COL 9.5-1 cross-references.

- VEGP COL 18.6-1

The applicant provided additional information in VEGP COL 18.6-1, describing the qualifications of the nuclear plant technical support personnel. VEGP COL 18.6-1 is addressed under Section 13.1.1.4, "Qualification of Technical Support Personnel," and Section 13.1.3.1, "Qualification Requirements." Table 1.8-202, "COL Item Tabulation," provides VEGP COL 18.6-1 cross-references.

- VEGP COL 18.10-1

The applicant provided additional information in VEGP COL 18.10-1 to address the responsibilities of the manager in charge of nuclear training. VEGP COL 18.10-1 is addressed in Section 13.1.1.3.1.3.2.2, "Manager of Fleet Training and Performance Improvement." Table 1.8-202, "COL Item Tabulation," provides VEGP 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."

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for VEGP COL 13.1-1, VEGP COL 9.5-1, VEGP COL 18.6-1, and VEGP COL 18.10-1 are given in Sections 13.1.1, "Management and Technical Support Organization," 13.1.2 and 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, "American National Standard for Selection, Qualification, and Training of Personnel for Nuclear Power Plants," as endorsed and amended by Regulatory Guide (RG) 1.8, "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, "Quality Assurance Program Requirements (Operation)"

13.1.4 Technical Evaluation

The Nuclear Regulatory Commission (NRC) staff reviewed Section 13.1 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.[8] 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 VEGP COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VEGP COL FSAR:

AP1000 COL Information Items

- VEGP COL 13.1-1

The NRC staff reviewed VEGP COL 13.1-1 related to the organizational structure of the COL applicant included under Section 13.1 of the VEGP COL FSAR. Section 13.1 of the VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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"

[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).

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 VEGP 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 VEGP 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.

- VEGP COL 9.5-1

The applicant added text to VEGP 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 VEGP 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 NRC staff reviewed VEGP COL 9.5-1 relative to the text added in Section 13.1.1.2.10 of the COL application. Based on the management descriptions provided in Section 13.1.1.2.10, the staff finds the applicant's fire protection organization meets the guidance of NUREG-0800.

- VEGP COL 18.6-1

The NRC staff reviewed VEGP 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 VEGP 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 VEGP 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 also stated that the qualification and experience requirements of headquarters staff will be established in its corporate policy and procedure manuals.

The applicant added text to VEGP 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 VEGP 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 VEGP COL FSAR Sections 13.1.1.4 and 13.1.3.1 relative to VEGP 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.

- VEGP COL 18.10-1

The NRC staff reviewed VEGP COL 18.10-1 included under Section 13.1.1.3.1.3.2.2, “Manager of Fleet Training and Performance Improvement.” 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 VEGP 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 VEGP COL FSAR related to this section. The results of the NRC staff’s technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VEGP 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:

- VEGP 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).

- VEGP COL 9.5-1, related to the fire protection organization meets the guidance of Section 13.1 of NUREG-0800 and is acceptable.

- VEGP 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).

- VEGP 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 VEGP 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 13.2 of the AP1000 DCD, Revision 19.

In addition, in VEGP 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 B1, C.3

The applicant proposed a license condition in Part 10 of the VEGP COL application, which provides the milestones for implementing the Reactor Operator Training (B.1) and the applicable portions of 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 applicable portions of Non-Licensed Plant Staff Training Program applicable related to radioactive material is addressed in Chapter 1 of this safety evaluation report (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 the VEGP 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, and Reactor Operator Requalification Program.

13.2.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the FSER related to the DCD.

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

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 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 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 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 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 with open items issued for the Bellefonte Nuclear Station (BLN), Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs) and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no open or confirmatory items to resolve.

The following portion of this technical evaluation section is reproduced from Section 13.2.4 of the BLN 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 Operator 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 proposes to include the following license conditions:

- 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VEGP 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 VEGP 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 reasonable assurance that they can be implemented. The emergency plans are an expression of the overall concept of operation, and describe the essential elements of advance planning that have been considered and the provisions that have been made to cope with radiological emergency situations.

The VEGP Early Site Permit (ESP) Application, Revision 5 proposed a complete and integrated emergency plan for the VEGP site, consisting of the applicant's onsite emergency plan, an evacuation time estimate (ETE), and associated offsite emergency plans, which the NRC staff reviewed under Docket Number 52-011. As documented in Section 13.3, "Emergency Planning," of NUREG-1923, "Safety Evaluation Report for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant (VEGP) ESP Site," July 2009, the staff concluded that the overall state of onsite and offsite emergency preparedness, when fully implemented, will meet the relevant regulatory requirements to support full-power operations. On August 26, 2009, the NRC issued VEGP ESP-004.

In regard to the offsite emergency plans, FEMA had previously reviewed the ESP application plans for the States of Georgia and South Carolina, the local government radiological emergency response plans (RERPs) for the Georgia county of Burke, and South Carolina counties of Aiken, Allendale, and Barnwell. FEMA provided its ESP application findings to the NRC on June 5, 2007. As a result of its review of the COL application, FEMA provided its findings in a letter dated October 24, 2008, entitled "Interim Finding Report on the Adequacy of Offsite Radiological Emergency Response Planning and Preparedness for Combined License Application for the Vogtle Site," stating that the finding and determinations made for the VEGP ESP application remain unchanged for the VEGP COL application. A summary of FEMA's conclusions from its ESP application review, which are applicable to the COL application, are provided below in SER Section 13.3.6.

Consistent with 10 CFR 52.83, "Finality of referenced NRC approvals; partial initial decision on site suitability," the staff's review of the COL application was limited by the scope and nature of the matters resolved in the previous VEGP ESP application and the AP1000 DC rule, and included those areas associated with the COL applicant's referencing of the VEGP ESP application Site Safety Analysis Report (SSAR) and the AP1000 standard DC; consistent with the relevant requirements of 10 CFR Part 52, "Licenses, certifications, and approvals for nuclear power plants." Specifically, the staff reviewed the resolution of ESP permit conditions (PCs) and variance (VAR), and AP1000 COL information (action) items and departure (DEP); including associated supplemental (SUP) information and exception.

13.3.2 Summary of Application

Section 13.3 of the VEGP COL FSAR, Revision 5, incorporates by reference Section 13.3 of the AP1000 DCD, Revision 19 and Section 13.3 of the VEGP ESP SSAR, Revision 5. In addition, the applicant provided the following in the VEGP COL application:

Tier 2 Departure

- VEGP DEP 18.8-1

The Operational Support Centers (OSCs) are being moved from the as low as (is) reasonably achievable (ALARA) Briefing Room to each unit's respective Control Support Area (CSA). In addition, the Technical Support Centers (TSCs) for both Units 3 and 4 are being moved from the CSA in the Annex Building to a central location in the lower level of a Communication Support Center (CSC) building sited between the Units 2 and 3 power blocks within the VEGP site protected area (see SER Section 13.3.4.3). Part 7, "Departures, Exemptions, and Variances," of the VEGP COL application provides additional information regarding this departure (identified as VEGP DEP 18.8-1). In a letter dated January 27, 2010, the applicant proposed to revise the TSC location departure from a Tier 2* to a Tier 2.[9]

Variance

- VEGP VAR 1.2-1

Part 7 of the COL application includes a variance from the VEGP ESP SSAR (identified as VEGP VAR 1.2-1), which addresses changes to various ESP and COL application FSAR figures (see SER Section 13.3.4.1). These figures include site layout information that is related to a change in TSC location within the VEGP site protected area, which is addressed in FSAR Section 13.3.7, "New or Additional Information."

AP1000 COL Information Items

- STD COL 13.3-1

The applicant provided additional information in Standard (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

[9] The definitions of Tier 1, Tier 2, and Tier 2*, which reflect information in the generic AP1000 DCD, are provided in Section II of Appendix D to 10 CFR Part 52.

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 supplemental information in STD SUP 13.3-1, which states that Table 13.4-201 provides milestones for EP implementation.

- VEGP SUP 13.3-2

The applicant provided supplemental information in VEGP SUP 13.3-2, which identifies new and additional EP information in Section 13.3.7 that would materially change the bases for compliance with EP requirements. This SUP is discussed further in this SER as part of the staff's evaluation of proposed License Condition 4 and VEGP VAR 1.2-1.

- VEGP SUP 14.3-1

The applicant provided the following statement in VEGP COL FSAR Section 14.3.2.3.1, in regard to EP inspections, tests, analyses, and acceptance criteria (ITAAC):

> EP-ITAAC were developed in the Early Site Permit (ESP) Application to address implementation of elements of the Emergency Plan. Site-specific EP-ITAAC are based on the generic ITAAC provided in Table 13.3-1 of SECY-05-0197 ["Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria"]. These ITAAC have been tailored to the specific reactor design and emergency planning program requirements.

The EP ITAAC are identified below, and this SUP is evaluated by the staff as part of its evaluation of ITAAC and License Condition 1 in SER Section 13.3.4.4.

Onsite Emergency Plan

Part 5, "Emergency Plan," of the COL application incorporates by reference the emergency plan in the referenced ESP, with various supplements and exceptions. The emergency plan includes the basic VEGP onsite emergency plan, Annexes V1 and V2, and nine appendices that provide additional information regarding various aspects of the VEGP emergency plan. The emergency plan is applicable to the proposed VEGP Units 3 and 4, as well as the existing Units 1 and 2. The staff's review and findings in this SER section apply only to the proposed VEGP Units 3 and 4.

Offsite Emergency Plans

The State and local (offsite) RERPs and the ETE were previously submitted (and reviewed by the NRC and FEMA) as part of the referenced ESP, and were not resubmitted as part of the COL application.

ESP Permit Conditions

- VEGP ESP PC 2 – An applicant for a COL referencing this ESP shall revise the Emergency Action Levels (EALs) for Unit 3 to reflect the final revision of Nuclear Energy Institute (NEI) 07-01, "Methodology for Development of Emergency Action Levels Advanced Passive Light Water Reactors."

- VEGP ESP PC 3 – An applicant for a COL referencing this ESP shall revise the EALs for Unit 4 to reflect the final revision of NEI 07-01.

- VEGP ESP PC 4 – An applicant for a COL referencing this ESP shall submit a fully developed EAL scheme for Unit 3 that reflects the completed AP1000 design details, subject to allowable ITAAC.

- VEGP ESP PC 5 – An applicant for a COL referencing this ESP shall submit a fully developed EAL scheme for Unit 4 that reflects the completed AP1000 design details, subject to allowable ITAAC.

- VEGP ESP PC 6 – An applicant for a COL referencing this ESP shall complete a fully developed set of EALs for Unit 3, which are based on in-plant conditions and instrumentation, including onsite and offsite monitoring, and which have been discussed and agreed on by the applicant or licensee and State and local governmental authorities, and shall include the full set of EALs in the COL application. If the EALs are not fully developed, the COL application shall include appropriate ITAAC for the fully developed set of EALs for Unit 3.

- VEGP ESP PC 7 – An applicant for a COL referencing this ESP shall complete a fully developed set of EALs for Unit 4, which are based on in-plant conditions and instrumentation, including onsite and offsite monitoring, and which have been discussed and agreed on by the applicant or licensee and State and local governmental authorities, and shall include the full set of EALs in the COL application. If the EALs are not fully developed, the COL application shall include appropriate ITAAC for the fully developed set of EALs for Unit 4.

- VEGP ESP PC 8 – An applicant for a COL referencing this ESP shall resolve the difference between the VEGP Units 3 and 4 common TSC, and the TSC location specified in the AP1000 certified design.

In Part 10, "Proposed License Conditions (Including ITAAC)," of the COL application, the applicant proposed License Condition 4 to address VEGP ESP PC 2 through VEGP ESP PC 7. The applicant addressed VEGP ESP PC 8 in VEGP DEP 18.8-1.

License Conditions

Part 10 of the COL application includes the following proposed license conditions related to EP:

- Part 10, License Condition 1

The applicant proposed a license condition to incorporate the ITAAC identified in Appendix B to Part 10 of the COL application.

- Part 10, License Condition 3, Item C.4

The applicant proposed a license condition for implementation of applicable portions of the EP program prior to initial receipt of the byproduct, source, or special nuclear materials onsite. This license condition, to support issuance of 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," licenses, is addressed in SER Section 1.5.5.

- Part 10, License Condition 4

The applicant proposed the following license condition:[10]

> The licensee shall submit a fully developed set of site-specific Emergency Action Levels (EALs) to the NRC in accordance with the NRC-endorsed version of NEI 07-01, Revision 0 with no deviations. 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.

In EP ITAAC 8.1.3 the applicant proposed a license condition that requires offsite full participation exercise deficiencies to be corrected prior to operation above 5 percent of rated power. A specific license condition is not required because this is now described in 10 CFR 50.54(gg).

- 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 program.

ITAAC

Part 10 of the COL application proposes License Condition 1 (described above), which incorporates the EP ITAAC in Appendix B of Part 10. Appendix B incorporates by reference the AP1000 DCD Tier 1 ITAAC, which includes the EP ITAAC in DCD Tier 1 Table 3.1-1. In addition, Appendix B incorporates by reference the EP ITAAC in VEGP ESP-004 (Appendix E), supplemented with EP (ITAAC) Unit 3 Acceptance Criterion 5.1.8 in Appendix B, which is associated with the TSC ventilation system. In a letter dated, November 2, 2010, the applicant proposed to add to Appendix B an additional Unit 3 EP ITAAC Acceptance Criterion 8.1.1.D.2.d, relating to equipment and data displays for the TSC and EOF. The EP ITAAC are evaluated below in SER Section 13.3.4.4.

[10] ESP Permit Conditions 2 and 3 reference the final revision of NEI 07-01, in relation to EALs. As part of its endorsement review of NEI 07-01, the staff subsequently identified Revision 0 of NEI 07-01, as that which should be used in the COL application EAL license condition.

13.3.3 Regulatory Basis

The regulatory basis of the AP1000 DCD information incorporated by reference is addressed in NUREG-1793, and its supplements. The regulatory basis of the VEGP ESP SSAR information that is incorporated by reference is addressed in NUREG-1923.

The applicable regulatory requirements and guidance for EP are as follows:

- 10 CFR 52.79(a)(21) 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 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 findings 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 50.33(g); 10 CFR 52.39(d); 10 CFR 52.77, "Contents of applications; general information"; 10 CFR 52.79(b)(4); 10 CFR 52.80, "Contents of applications; additional technical information"; 10 CFR 52.93(b); 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 Part 353, "Memorandum of Understanding (MOU) Between Federal Emergency Management Agency and Nuclear Regulatory Commission Relating to Radiological Emergency Planning and Preparedness," (58 FR 47996, 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. The guidance in NUREG-0654/FEMA-REP-1, Revision 1, provides a basis for State and local governments to develop radiological emergency plans.

13.3.4 Technical Evaluation

The NRC staff reviewed the information in the VEGP COL application, including Section 13.3, "Emergency Planning," of the VEGP COL FSAR, and checked the referenced DCD and VEGP ESP SSAR to ensure that the combination of the DCD, the VEGP ESP SSAR, and the COL

application represents the complete scope of information relating to this review topic.[1] The staff's review confirmed that the information in the application and incorporated by reference addresses the required information relating to emergency planning. The results of the staff's evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements, and in NUREG-1923.

A detailed technical evaluation of the proposed complete and integrated emergency plan for VEGP Units 3 and 4 was performed by both the NRC and FEMA as part of their review of the VEGP ESP application. The results of the staff's and FEMA's review of the VEGP Units 3 and 4 ESP application, reflected in NUREG-1923, establish the basis for the staff's findings of reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency. This SER section supplements the review of the ESP application. The staff's review and findings in this SER section apply only to the proposed VEGP Units 3 and 4. Any changes to the emergency plan for VEGP Units 1 and 2 would be addressed as a separate licensing action, in accordance with 10 CFR 50.54(q).

In addition, the staff conducted four site area visits to VEGP, consisting of reviews of existing onsite emergency response facilities and various areas within and beyond the 10-mile emergency planning zone (EPZ). These visits were conducted on May 11, 2006; October 18, 2006; October 4, 2007; and July 17, 2008.

13.3.4.1 *Variance VEGP VAR 1.2-1*

Pursuant to 10 CFR 52.39(d) and 10 CFR 52.93(b), an applicant for a COL referencing an ESP may include in its application a request for a variance from one or more site characteristics, design parameters, or terms and conditions of the permit, or from the SSAR. In determining whether to grant the variance, the Commission shall apply the same technically relevant criteria as were applicable to the original or renewed ESP.

In Part 7 of the COL application, the applicant requested a variance pursuant to 10 CFR 52.79(b)(2), which addresses a change in the TSC location on various ESP SSAR figures. Specifically, VEGP VAR 1.2-1 states that ESP SSAR Figures 1-4, 1-5, 13.3-2, and ESP SSAR Part 5 Figure ii should not be incorporated into the COL application. These figures include site layout information, including the common TSC location, which has been superseded by information in VEGP COL FSAR Section 1.1, Figure 1.1-202 ("Site Layout").

Consistent with 10 CFR 52.79(b)(4), in VEGP COL FSAR Section 13.3.7 (i.e., VEGP SUP 13.3-2), the applicant identified two changes to the ESP emergency plan. The first change addresses the removal of the proposed VEGP EAL scheme from the VEGP emergency plan and the addition of proposed License Condition 4. (License Condition 4 is discussed below in SER Section 13.3.4.2.) The second change (discussed below) addresses the relocation of the TSC from the proposed administration building to a proposed CSC, which is also reflected in the specific figure changes in VEGP VAR 1.2-1 (see above). The applicant stated that the changes identified in Section 13.3.7 require prior NRC approval in accordance with 10 CFR 50.54(q).

Prior approval of emergency plan changes under 10 CFR 50.54(q) applies to changes that decrease the effectiveness of an approved emergency plan. Under 10 CFR 52.79(b)(4), the applicant must identify changes that constitute or would constitute a decrease in effectiveness under 10 CFR 50.54(q). The staff reviewed the changes in VEGP COL FSAR Section 13.3.7, associated with the relocation of the TSC to the proposed CSC (including VEGP VAR 1.2-1),

and determined that they would not constitute a decrease in effectiveness under 10 CFR 50.54(q) because they do not result in the degradation or loss of the capability to perform an emergency planning function, or to perform a function in a timely manner, as included in the emergency plan.[11] Further, as addressed in this SER section, the changed emergency plan will continue to meet the applicable standards and requirements.

Pursuant to 10 CFR 52.79(b)(4), the applicant must provide new or additional information that updates and corrects the information that was provided in the ESP under 10 CFR 52.17(b), and discuss whether the new or additional information materially changes the bases for compliance with the applicable regulations. The staff's review of the new or additional information at the COL application stage verifies this compliance. This SER section addresses the staff's evaluation of VEGP VAR 1.2-1, including the related TSC relocation changes identified in VEGP COL FSAR Section 13.3.7.

In VEGP COL FSAR Section 13.3.7, the applicant stated that the TSC has been relocated from the proposed administration building to a proposed CSC building, resulting in moving the TSC approximately 150 feet east of the location identified in the ESP emergency plan. The change is reflected in a revised Figure ii, "Vogtle Electric Generating Plant Site Plan," and Section H of the emergency plan. The staff reviewed the referenced figures, and determined that the requested variance retains the TSC within the VEGP site protected area between the Unit 2 and Unit 3 power blocks. The related TSC relocation associated with Tier 2 departure VEGP DEP 18.8-1 (Part II) is identified above in SER Section 13.3.2, and discussed below in SER Section 13.3.4.3.

In RAI 13.3-1, the staff asked the applicant to provide a readable figure that clearly shows the TSC location on the VEGP site, and provide the TSC's approximate distances from the site's vital areas. In its April 3, 2009, response to RAI 13.3-1, the applicant provided a revised figure that clearly shows the TSC location in the CSC (Building No. 305); which is reflected in VEGP COL FSAR Figure 1.1-202 and Part 5 of the COL application (Emergency Plan) revised Figure ii. In its June 18, 2009, supplemental response to RAI 13.3-1, the applicant provided a clearer site plan figure (revised Figure ii). The applicant also stated that the distances from the TSC to the Units 3 and 4 control rooms are about 1000 feet and 1700 feet, respectively. In addition, the walking distances between the TSC and the Unit 3 and Unit 4 control rooms are estimated to be about 1800 feet and 2500 feet, respectively. In Part 5 of COL application, the applicant stated that Section H.1.1, "Technical Support Center (TSC)," of the ESP emergency plan has been revised to add the statement that "[m]otorized vehicles are provided to facilitate the movement of personnel between the TSC and the Site's Control Rooms." Further, during the related proceedings by the NRC Atomic Safety and Licensing Board (ASLB), the applicant stated that it would take approximately ten minutes to walk between the TSC and the Unit 4 control room.[12]

The staff reviewed the TSC location shown in the revised Figure ii to determine whether this new or additional information, identified in VEGP COL FSAR Section 13.3.7 and discussed by the applicant in its response to RAI 13.3-1, materially changes the bases for compliance with the applicable requirements for TSC location (see 10 CFR 52.79(b)(4)). In addition, the staff determined whether requested variance VEGP VAR 1.2-1 is acceptable by evaluating the new TSC location against the same technically relevant criteria as were applicable to the TSC

[11] See Regulatory Issue Summary (RIS) 2005-02, "Clarifying the Process for Making Emergency Plan Changes," February 14, 2005.
[12] See ASLB VEGP ESP Hearing Transcript, March 24, 2009 (Tr. at M-2084).

location in the original (referenced) ESP; as discussed in the VEGP ESP SSAR, and Section 13.3.3.2.8, "Emergency Facilities and Equipment," of the related NUREG-1923.

The regulatory basis for the staff's evaluation is essentially the same for both the applicant's identified new or additional information and VEGP VAR 1.2-1; that is, whether the new TSC location meets the applicable requirements in 10 CFR 52.79(a)(21), 10 CFR 50.47(b)(8), and Section IV.E of Appendix E to 10 CFR Part 50. The associated guidance that is applicable to an evaluation of the TSC location is located in Section 2.2 of NUREG-0696, "Functional Criteria for Emergency Response Facilities," and Section 8.2.1.b of NUREG-0737, "Clarification of TMI Action Plan Requirements," (Supplement 1). Specifically, the TSC should be located near the control room (i.e., within a walking distance of 2 minutes) with no major security barriers between the two facilities other than access control stations, and located within the site protected area so as to facilitate necessary interaction with control room and other personnel involved with the emergency.

The staff had previously examined the applicant's proposed common TSC location, including consideration of the 2-minute walking distance criterion during the ESP application review, and found that the location was acceptable; subject to a demonstration of adequacy during a full participation exercise (see Section 13.3.3.2.8 of NUREG-1923). The staff further addressed the TSC location during the related proceedings by the NRC Advisory Committee on Reactor Safeguards (ACRS)[13] and ASLB.[14]

The staff finds that the new TSC location in the CSC is acceptable because the TSC remains within the same VEGP protected area between the Unit 2 and Unit 3 power blocks, and meets the same technically relevant criteria as were applicable to the original ESP (identified above); as required by 10 CFR 52.39(d) and 10 CFR 52.93(b). The staff did not reconsider the 2-minute walking distance criterion because of the small change in TSC location (i.e., approximately 150 feet) from that approved during the staff's review of the ESP application, and for the same reasons provided in Section 13.3.3.2.8 of NUREG-1923, which are applicable to the new TSC location addressed in this SER section.

Further, the staff finds that the new or additional information in VEGP COL FSAR Section 13.3.7, associated with the TSC location and VEGP VAR 1.2-1, is acceptable because it does not materially change the bases for compliance with the applicable requirements. Therefore, the staff concludes that VEGP VAR 1.2-1 is acceptable. The incorporation of the changes identified in the applicant's response to RAI 13.3-1 into a future revision of the COL application is **Confirmatory Item 13.3-1**.

Resolution of VEGP Site-Specific Confirmatory Item 13.3-1

Confirmatory Item 13.3-1 is an applicant commitment to revise its FSAR Section 13.3.7 and the Emergency Plan to reflect the changes identified in a response to RAI 13.3-1. The staff verified that the VEGP COL FSAR and the Emergency Plan were appropriately revised. As a result, Confirmatory Item 13.3-1 is now closed.

[13] See ACRS ESP Subcommittee Transcript, December 3, 2008 (Tr. at 156 to 189).
[14] See ASLB VEGP ESP Hearing Transcript, March 24, 2009 (Tr. at M-2172 to M-2186).

13.3.4.2 *ESP Permit Conditions VEGP ESP PC 2 through PC 8 and License Condition 4*

On August 15, 2006, Southern Nuclear Operating Company (ESP applicant) submitted to the Commission its VEGP ESP application (dated August 14, 2006), and on August 17, 2006, supplemented the application with additional EP information. The ESP application included a complete and integrated emergency plan in support of the proposed VEGP Units 3 and 4, pursuant to 10 CFR 52.17(b)(2)(ii). The NRC completed its ESP application review and issued the SER with open items on September 14, 2007 (dated August 30, 2007). Section 13.3, "Emergency Planning," of the SER with open items included COL Action Items 13.3-1, 13.3-2 and 13.3-3, which address EALs and TSC location. The NRC replaced these three COL action items with seven PCs (i.e., VEGP ESP PC 2 through VEGP ESP PC 8) in the FSER, which was completed in February 2009, and published July 2009 (NUREG-1923, see SER Section 13.3.2, above). The permit conditions are also listed in the VEGP ESP (VEGP ESP-004).

In its March 28, 2008, COL application, the applicant addressed the three COL action items, rather than the seven PCs, because the COL application was based on the (then currently available) ESP application SER with open items. The NRC had not yet issued the VEGP ESP FSER. In RAI 13.3-4, the staff asked the applicant to describe the resolution of the seven VEGP ESP PCs in the FSER; including how each PC is met. In its response to RAI 13.3-4, the applicant replaced the three COL action items with the seven PCs, and reflected those changes in the COL application.

<u>VEGP ESP PC 2 through VEGP ESP PC 7</u>

VEGP ESP PC 2 through VEGP ESP PC 7 relate to the completion of a fully developed EAL scheme for each reactor. Specifically, VEGP ESP PC 2 and VEGP ESP PC 3 address NEI 07-01, and VEGP ESP PC 4 and VEGP ESP PC 5 address completion of the AP1000 design details. VEGP ESP PC 6 and VEGP ESP PC 7 reflect applicable requirements from Appendix E to 10 CFR Part 50, which relate to as-built plant conditions and interfaces with offsite governmental agencies.

In RAI 13.3-3, the staff identified two options associated with submission of an EAL scheme in support of the COL application for VEGP Units 3 and 4. The staff asked the applicant to identify its preferred option and to provide the detailed EAL information in support of this option. Option 1 was the submission of an entire EAL scheme, which includes all site-specific information. Option 2 had four parts (critical elements) that addressed the submission of an overview of the EAL scheme using NEI 07-01, and the proposal of a license condition that addresses EAL completion and submission to the NRC. In its June 18, 2009, response to RAI 13.3-3, the applicant committed to Option 2 and addressed the four critical elements associated with Option 2, including proposing a license condition for the creation of a fully developed set of site-specific EALs (see proposed License Condition 4 in SER Section 13.3.2, above). The proposed license condition did not include EAL review and agreement by State and local governmental authorities, and in its April 28, 2010, supplemental response to RAI 13.3-3, the applicant revised the license condition to include the necessary language. The applicant also addressed the EAL scheme and proposed license condition in VEGP COL FSAR Section 13.3.7 (i.e., VEGP SUP 13.3-2), discussed above in SER Section 13.3.4.1. The staff finds that the applicant has resolved RAI 13.3-3 because the proposed revised license condition includes the necessary language regarding State and local review, and therefore the response adequately addresses the four critical elements of Option 2.

The staff finds that the applicant has addressed the requirements of VEGP ESP PC 2 through VEGP ESP PC 7, in relation to the submission of an EAL scheme, because the specific requirements in the permit conditions are all reflected in the applicant's proposed License Condition 4. Specifically, the proposed License Condition 4 meets VEGP ESP PC 2 and VEGP ESP PC 3 by stating that the EALs will be in accordance with the NRC-endorsed version of NEI 07-01, Revision 0, with no deviations. The submission of a fully developed set of site-specific EALs – required by License Condition 4 – meets VEGP ESP PC 4 through VEGP ESP PC 7, as this will reflect the completed AP1000 design details, including in-plant conditions and instrumentation, and onsite and offsite monitoring. This is also supported by VEGP ESP-004 (Appendix E) EP ITAAC 1.1.2 (for Units 3 and 4), which states that "[a]n analysis of the EAL technical bases will be performed to verify as-built, site-specific implementation of the EAL scheme." Finally, License Condition 4 meets VEGP ESP PC 6 and VEGP ESP PC 7 by stating that the EALs shall have been discussed and agreed upon with State and local officials. Therefore, the staff concludes that the applicant has met the requirements of VEGP ESP PC 2 through VEGP ESP PC 7, and proposes to include the following license condition, which includes minor revisions to proposed License Condition 4:

> The licensee shall submit a fully developed set of plant-specific Emergency Action Levels (EALs) for Vogtle Units 3 and 4 in accordance with NEI 07-01, "Methodology for Development of Emergency Action Levels Advanced Passive Light Water Reactors," Revision 0, with no deviations. 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.

VEGP ESP PC 8

VEGP ESP PC 8 requires that a COL applicant referencing VEGP ESP-004 shall resolve the difference between the VEGP Units 3 and 4 common TSC, and the TSC location specified in the AP1000 certified design. The resolution of VEGP ESP PC 8 is based on the staff's evaluation of the common TSC habitability, together with the evaluation of the applicant's requested AP1000 DCD Tier 2 departure. This SER section addresses the habitability of the common TSC (both radiological and non-radiological), as described in Section 13.3.3.2.8 of NUREG-1923, including the impact of the requested variance (VEGP VAR 1.2-1) discussed above in SER Section 13.3.4.1. The AP1000 DCD departure (i.e., VEGP DEP 18.8-1) is addressed below in SER Section 13.3.4.3.

In support of the VEGP ESP mandatory hearings, the staff responded to an ASLB written question regarding the protection of TSC personnel from non-radiological hazards.[15] The following provides (in part) staff's written *Response No. 25 (Musico)*:

> During the Staff's review of a COL application that references the Vogtle ESP, as part of verifying the resolution of Permit Condition 8, the Staff will determine the ability of the TSC to protect TSC personnel from non-radiological hazards. The verification that Permit Condition 8 has been met will include confirmation that the COL applicant has resolved the differences between the VEGP Units 3 and 4 common TSC and the TSC location specified in the AP1000 certified design.

[15] NRC ASLB pleading (VEGP ESP application): *NRC Staff Response to the Licensing Board's Questions Regarding Safety Matters* (at 46 through 48), January 16, 2009, Docket No. 52-011-ESP.

> [S]ince the ESP application identifies a common TSC in a separate building on the Vogtle site – a TSC location that is not part of the AP1000 certified design – design matters including the habitability (both radiological and non-radiological) of this common TSC will need to be re-evaluated as part of the Staff's review of the COL application, and without credit for previously approved design certification features. AP1000 certified design features that support TSC habitability (e.g., the TSC ventilation system in the annex building CSA) will not apply to a TSC that is not located in the CSA. . . .
>
> While Permit Condition 8 does not specifically address TSC design features associated with personnel protection, the applicable NRC TSC habitability requirements and guidance would still apply. . . . Staff review of design matters including the common TSC's structure and ventilation system will be required at the COL application stage to ensure adequate personnel protection – both radiological and non-radiological.

Paragraph IV.E.8 of Appendix E to 10 CFR Part 50 requires that an onsite TSC be provided from which effective direction can be given and effective control can be exercised during an emergency. The associated guidance in NUREG-0696 Section 2.6 states that the TSC shall have the same radiological habitability as the control room under accident conditions, and TSC personnel shall be protected from radiological hazards to the same degree as control room personnel (see also, Section 8.2.1.f of NUREG-0737, Supplement 1). The radiation protection design of the TSC is acceptable if the total calculated radiological consequences for the postulated fission product release fall within the exposure acceptance criterion specified for the control room of 5 roentgen equivalent man (rem) total effective dose equivalent (TEDE) for the duration of the accident. [16]

In RAI 13.3-6, the staff asked the applicant to identify all applicable habitability requirements that apply to the TSC located in the CSC, and describe how they will be satisfied. In addition, explain the applicability of ITAAC (Design Commitment) 6, from AP1000 DCD Tier 1 Table 3.1-1, to the TSC located in the CSC. In its June 26, 2009, response to RAI 13.3-6 and RAI 13.3-7, the applicant stated that the TSC radiological habitability requirements are designed to meet the guidance in NUREG-0696, and that the TSC will be designed to meet the same habitability requirements that are outlined in the AP1000 DCD for the CSA.[17] (The radiological habitability of the TSC is also addressed below in applicant's response to RAI 13.3-7.) The applicant provided additional information associated with both radiological and non-radiological protections, and proposed the following new Unit 3 EP ITAAC Acceptance Criterion 5.1.8 in Appendix B of Part 10 of the COL application.

> 5.1.8 Controls and displays exist in the TSC to control and monitor the status of the TSC ventilation system including heating and cooling, and the activation of the HEPA [high-efficiency particulate air] and charcoal filter system upon detection of high radiation in the TSC.

In RAI 13.3-7, the staff also asked the applicant to provide the radiological consequence analyses for the VEGP site common TSC, for the postulated design basis accidents (DBAs)

[16] *TEDE* means the sum of the effective dose equivalent for external exposures and the committed effective dose equivalent for internal exposures (see 10 CFR 20.1003). *Rem* is a special unit of radiation dose equivalent (see 10 CFR 20.1004). Appendix A to 10 CFR Part 50, entitled *General Design Criteria for Nuclear Power Plants*, includes *Criterion 19—Control Room*, which requires adequate radiation protection for control room personnel under accident conditions for the duration of the accident.
[17] See Section 13.3.3.3, *Technical Support Center Habitability*, of NUREG-1793.

associated with the AP1000 standard design. In its response to RAI 13.3-6 and RAI 13.3-7, the applicant provided a discussion of the TSC radiological habitability analysis for the TSC to be located in the CSC. The applicant stated that the TSC will be designed to meet the same habitability requirements as outlined in the AP1000 DCD for the CSA, and that TSC habitability requirements will be met through ITAAC related to the TSC (see Unit 3 ITAAC 5.1 in Appendix E of VEGP ESP-004, and below in SER Table 13.3-1, "VEGP Unit 3 ITAAC"). The TSC-related ITAAC will include establishment of the TSC, including verification of its configuration; cooling; habitability upon detection of radiation; and heating, ventilation and air conditioning (HVAC) controls and displays.

Although the applicant's RAI response indicated that the detailed design phase of the TSC spaces and HVAC system is not complete at this time, the discussion provided information on the design concept sufficient to perform DBA 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 to the nonsafety nuclear island nonradioactive ventilation system (VBS) described in AP1000 DCD Section 9.4, which serves the CSA in the AP1000 design.

The applicant evaluated the radiological consequences in the TSC of a loss-of-coolant accident (LOCA) at VEGP Unit 3 or 4 to show compliance with the TSC radiological habitability requirements. The LOCA is the bounding DBA for TSC habitability. The applicant stated that the HVAC system flow rates, unfiltered in-leakage, out-leakage, and filtration efficiencies are bounding values for the purposes of the RAI response, 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 VEGP Unit 3 containment to the TSC air intake, as used in the LOCA TSC radiological habitability analysis. The dispersion, and therefore, the χ/Q values, at the TSC intake for a release from VEGP Unit 3 would be less than that for a release from VEGP Unit 4 because of the relative location of the accident releases for each unit to the TSC air intake.

The staff performed an independent verification of the applicant's TSC χ/Q values based on information given in the VEGP Units 3 and 4 FSAR and Emergency Plan, and determined that the TSC χ/Q values are reasonable. The staff reviewed the description of the radiological habitability analysis 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" (July 2000), for performing DBA radiological consequences analyses. The applicant's calculated TEDE in the TSC from a LOCA is 3.2 rem (for the duration of the accident), which meets the radiological exposure acceptance criterion of 5 rem TEDE. The staff performed an independent calculation using the design values given in the RAI response and was able to confirm the applicant's dose results.

The TSC-related ITAAC will verify the TSC design, which was bounded by the TSC radiological habitability analysis discussed in response to RAI 13.3-7. Based on the above discussion, the staff finds that the radiation protection design of the TSC is acceptable and the TSC radiological habitability requirements will be met, because the total calculated radiological consequences for the postulated fission product release fall within the exposure acceptance criterion identified above. In addition, the staff finds that the applicant's responses to RAI 13.3-6 and RAI 13.3-7, including Unit 3 ITAAC Acceptance Criterion 5.1.8, adequately address the non-radiological habitability for the TSC, which include facility cooling, heating, humidity, electrical power,

ventilation and air filtration. The staff further finds that the applicant's RAI responses, together with the TSC-related information in the referenced VEGP ESP SSAR and AP1000 DCD, ensure that adequate protection, both radiological and non-radiological, will be provided for TSC personnel during accident conditions.

As stated above, in addition to the staff's evaluation of the common TSC's habitability, the resolution of VEGP ESP PC 8 includes the staff's evaluation of the applicant's requested AP1000 DCD Tier 2 departure (VEGP DEP 18.8-1), which addresses TSC and OSC relocations associated with the referenced certified design. As a result of the staff's evaluation (above) of the radiological and non-radiological habitability of the TSC, and the acceptability of the Tier 2 departure associated with the TSC and OSC relocations (addressed below in SER Section 13.3.4.3), the staff finds that the applicant has adequately resolved the difference between the VEGP Units 3 and 4 common TSC and the TSC location specified in the AP1000 certified design. Therefore, the staff concludes that the applicant has met the requirements VEGP ESP PC 8.

13.3.4.3 *Departure VEGP DEP 18.8-1*

Consistent with Section VIII.B.5 of Appendix D, "Design Certification Rule for the AP1000 Design," to 10 CFR Part 52, a COL applicant may depart from the AP1000 DCD Tier 2 information without prior NRC approval. In VEGP COL FSAR Table 1.8-201, "Summary of FSAR Departures from the DCD" (VEGP SUP 1.8-1) and Section A of Part 7 of the COL application, the applicant described the proposed AP1000 DCD Tier 2 departure VEGP DEP 18.8-1. The departure consists of Parts I and II, which reflect moving the locations for the OSC and TSC, respectively. As described below in Part I, the OSCs for Units 3 and 4 are being moved from the ALARA Briefing Room to each unit's respective CSA. In Part II, the TSCs for both units are being moved from the CSA to a common TSC in the CSC.

Part I. Relocation of the OSC

The applicant's request for approval of the new OSC location (in the CSA) is characterized in Part 7 of the COL application as a *Tier 2* departure. As part of its review of the ESP application, the staff evaluated the adequacy of the proposed OSC, including the associated ITAAC, and documented its review in Section 13.3.3.2.8 of NUREG-1923. The staff found that the OSC met the relevant requirements, subject to resolution of the TSC location, associated with VEGP ESP PC 8 (see SER Sections 13.3.2 and 13.3.4.2, above).

In Part 5 (Emergency Plan) of the ESP application, the applicant stated that the OSCs are located in each unit's CSA, which is adjacent to the passage from the annex building to the nuclear island control room. The OSC location is identified on AP1000 DCD figures in Sections 1.2 and 12.3, and Appendix 9A. Further, VEGP COL FSAR Section 1.2.3, "Plant Arrangement Description," states that Figure 1.2-201 (Annex Building General Arrangement [Plan] Elevation 100'-0" and 107'-2") replaces DCD Tier 2 Figure 1.2-18 to reflect the relocation of the OSC. The ALARA Briefing Room is also shown on Figure 1.2-201 as Room 40318. Figure 1.2-201 includes security-related information, and is withheld under 10 CFR 2.390(d). In RAI 13.3-2, the staff asked the applicant to clarify the location of the OSC and the ALARA Briefing Room, which would serve as backup OSC space. In its response to RAI 13.3-2, the applicant stated that the OSC for Units 3 and 4 will be located in the respective unit's CSA, which is located in Room 40403 on Elevation 117'6" (reference DCD Tier 2 Figure 1.2-19).

In SER Section 13.3.4.2 (above), the staff determined that the applicant adequately resolved the TSC location, associated with VEGP ESP PC 8, such that the location of the OSC in each unit's CSA is possible because the TSC has been moved to a central location. The requirements for TSC and OSC location, habitability, communications, etc. are provided in NUREG-0696 and Supplement 1 to NUREG-0737, and are addressed in Section 13.3.3.2.8 of NUREG-1923. Since the CSA meets the TSC requirements, which exceed the OSC requirements due to the respective support functions of the two facilities, the CSA will adequately support the OSC.

In Part 7 of the COL application, the applicant evaluated Part I of VEGP DEP 18.8-1 pursuant to Section VIII.B.5.b of Appendix D to 10 CFR Part 52. The applicant found that the departure is for a nonsafety-related system, that the alternate location of the OSC meets applicable requirements, and relocating the OSC does not adversely affect its function. The staff agrees with the applicant's evaluation. Further, pursuant to 10 CFR 52.81, "Standards for review of applications," and 10 CFR 50.47(b)(8), the applicant must provide adequate emergency facilities (including the OSC) to support the emergency response. The staff finds that the relocation of the units' OSC 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 VEGP DEP 18.8-1 (Part I) is acceptable.

Part II. Relocation of the TSC

Consistent with Revision 17 of the AP1000 DCD, the applicant's request for approval of the new TSC location (in the CSC) is characterized in Part 7 of the COL application (Revision 2) as a *Tier 2** departure. The current approved AP1000 DC is based on DCD Revision 15, which identifies the TSC location in the annex building as a *Tier 1* ITAAC (see DCD Tier 1 Table 3.1-1). Westinghouse's AP1000 DCD amendment application included Technical Report Number 107 (APP-GW-GLR-107, Revision 1), June 14, 2007, entitled "AP1000 Technical Support Center (TR107)," which addressed changing the DCD tier designation for the TSC location from Tier 1 to Tier 2*. In response to the staff's position that the TSC location designation should be Tier 2, rather than Tier 2*, Westinghouse proposed to revise AP1000 DCD Tier 2 Section 18.8.3.5 to reflect the TSC location as Tier 2 information.[18] The applicant's response to this revision is addressed below.

As described in Section 13.3.3.2.8 of NUREG-1923, the staff previously evaluated the proposed common TSC for Units 3 and 4. The TSC location changes comprise the proposed COL application departure in VEGP DEP 18.8-1 (Part II), including the related variance VEGP VAR 1.2-1 (discussed above in SER Section 13.3.4.1). The staff considered the proposed changes identified in the ESP application, because various aspects of the design were integral to the staff's evaluation of a complete and integrated emergency plan (e.g., the TSC location). The staff concluded that from a support and functional standpoint, the proposed common TSC location is acceptable, subject to a demonstration of adequacy during the full participation exercise (see Unit 3 EP ITAAC 8.1).

While the ESP application identified the AP1000 as the applicable reactor design for the new units, the certified design was not part of the application. In order to address various aspects of

[18] See NRC letter, dated September 15, 2009, entitled *Safety Evaluation Report with Open Items for Chapter 13, Not Including Section 13.6, Titled "Conduct of Operations," of NUREG-1793, Supplement 2 – AP1000 Design Certification Amendment*, Agencywide Documents Access and Management System (ADAMS) Accession No. ML092540088. Resolution of the DCD tier designation for the TSC location is identified as SER Open Item TR107-NSIR-07. See also, Westinghouse's January 27, 2010, letter, "AP1000 Response to Proposed Open Item (Technical Report 107)" (ADAMS Accession No. ML100330397).

the proposed complete and integrated emergency plan in the ESP application, the staff needed to consider the anticipated AP1000 DCD change (i.e., TSC relocations) that would be reflected as a DCD departure in a subsequent COL application (i.e., VEGP DEP 18.8-1, Part II). While the staff was able to conclude that the proposed common TSC is acceptable, the staff could not evaluate the proposed DCD departure at the ESP stage because the certified design was not part of the ESP application. In order to resolve the approval of the proposed common TSC with the related (future) COL application DCD change (i.e., departure), the staff identified VEGP ESP PC 8.

At the ESP stage, the staff recognized that, due to the regulatory structure of 10 CFR Part 52, the ESP application review of the TSC relocations would need to be addressed in the subsequent COL application review in relation to the referenced AP1000 DCD. In support of the VEGP ESP mandatory hearings, the staff responded to an ASLB written question regarding the TSC location.[19] The following provides (in part) staff's written *Response No. 24 (Musico)*:

> While the ESP application proposes a common TSC and identifies the AP1000 for Units 3 and 4, it does not reconcile the clear difference in TSC location between the application and certified design (i.e., a common TSC located between Units 2 and 3 versus a separate TSC in each Unit 3 and 4 Annex Building); hence, the need for Permit Condition 8 (see below).
>
> The Staff's evaluation and findings as to the acceptability of the common TSC – in lieu of a TSC located in each of the Annex Buildings for the Units 3 and 4 AP1000 reactor designs – are necessarily limited in scope at the ESP stage. The Staff's review at the ESP stage focused on the support and functional characteristics of a common TSC that is located greater than two minutes from the Units 3 and 4 control rooms. While the applicant identified that the AP1000 had been chosen for Units 3 and 4, the AP1000 DCD was not part of the ESP application; and therefore, was not within the scope of the Staff's review. . . .
>
> The final AP1000 DCD and Vogtle Units 3 and 4 ESP will be incorporated by reference into a COL application for the Vogtle site, at which time the Staff will confirm its review of the TSC location, including with respect to applicable portions of the certified design. . . . The Staff's review of the TSC location at the COL stage will focus on the COL applicant's resolution of the conflict in the TSC location between the ESP application and the AP1000 DCD, as required by Permit Condition 8.

In Part 7 of the COL application (Revision 2), the applicant resolved the TSC location conflict with an AP1000 DCD departure (i.e., VEGP DEP 18.8-1, Part II), characterizing the TSC location change as a Tier 2* departure. As described above, Westinghouse subsequently proposed to revise the DCD to change the TSC location designation from Tier 2* to Tier 2 information. In its letter of July 9, 2010, "Voluntary Revision to Application Part 7 Involving Departure Report," the applicant proposed to change the TSC location departure from a Tier 2* to a Tier 2. Pursuant to Section VIII.B.5.b of Appendix D to 10 CFR Part 52, the applicant evaluated Part II of VEGP DEP 18.8-1 and found that the departure is for a nonsafety-related system, that the alternate location of the TSC meets applicable requirements, and that relocating the TSC does not adversely affect its function. The staff agrees with the applicant's

[19] NRC ASLB pleading (VEGP ESP application): *NRC Staff Response to the Licensing Board's Questions Regarding Safety Matters* (at 41 through 46), January 16, 2009, Docket No. 52-011-ESP.

evaluation, and has identified the incorporation of these changes in a future revision to the COL application as **Confirmatory Item 13.3-2**.

Resolution of VEGP Site-Specific Confirmatory Item 13.3-2

Confirmatory Item 13.3-2 is an applicant commitment to revise its Part 7 of the application to reflect the change associated with the TSC location departure. The staff verified that the VEGP COL application Part 7 was appropriately revised. As a result, Confirmatory Item 13.3-2 is now closed.

The staff finds that the relocation of the units' TSC to the CSC is acceptable because the common TSC will provide an area that meets applicable regulatory requirements for a TSC, as previously evaluated by the staff and described in Section 13.3.3.2.8 of NUREG-1923. As such, the common TSC will adequately support its intended emergency response functions. Therefore, the staff concludes that VEGP DEP 18.8-1 (Part II) resolves the conflict in the TSC location between the ESP application and the AP1000 DCD, and is therefore acceptable. The radiological and non-radiological habitability of the common TSC is addressed above in SER Section 13.3.4.2, VEGP ESP PC 8.

13.3.4.4 *AP1000 COL Information Items, ITAAC, and License Conditions*

VEGP COL FSAR Table 1.8-202, "COL Item Tabulation," identifies two COL information items from AP1000 DCD Tier 2 Section 13.3.1, relating to EP. These consist of STD COL 13.3-1 and STD COL 13.3-2, which correspond to COL Action Items 13.3-1 and 13.3.3.3.5-1 in Section 13.3 of NUREG-1793. The following addresses the resolution of these two COL information items, including resolution of an *exception* to SRP acceptance criteria in NUREG-0800 (i.e., VEGP SUP 14.3-1).

- STD COL 13.3-1

COL Information Item 13.3-1 requires that COL applicants referencing the AP1000 certified design will address EP, including post-72 hour actions and its communications interface. In its May 27, 2010, letter, the applicant proposed a revision to VEGP COL FSAR Section 13.3, which included supplemental information that incorporates by reference the EP information into the FSAR, as required by 10 CFR 52.79(b)(1). The change is reflected in the following revised excerpt from Section 13.3, which addresses STD COL 13.3-1.

> 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 Subsections 1.9.5.4 and 6.3.4, are addressed in DCD Subsections 6.2.2, 8.3, and 9.1.3. Provisions for establishing post-72 hour ventilation for the main control room, instrumentation and control rooms, and dc equipment rooms are established in operating procedures.

VEGP COL FSAR Table 1.6-201, "Additional Material Referenced," lists the VEGP Units 3 and 4 emergency plan and references VEGP COL FSAR Section 13.3 and COL application Part 5. Part 5 of the COL application incorporates by reference Part 5 (i.e., Emergency Plan, Revision 5) of the referenced VEGP ESP application. The applicant also

listed in Part 2 (FSAR) and Part 5 of the COL application, specific variances and/or supplements applicable to the ESP emergency plan, including various supplements (i.e., VEGP SUP 13.3-2) that constitute new or additional information (see VEGP COL FSAR Section 13.3.7). The staff has identified the incorporation of the change to FSAR Section 13.3 (described above) in a future revision to the COL application as **Confirmatory Item 13.3-3**.

Resolution of VEGP Site-Specific Confirmatory Item 13.3-3

Confirmatory Item 13.3-3 is an applicant commitment to revise its FSAR Section 13.3 regarding the Emergency Plan including post-72 hour actions and its communications interface. The staff verified that the VEGP COL FSAR was appropriately revised. As a result, Confirmatory Item 13.3-3 is now closed.

As mentioned above, a detailed technical evaluation of the proposed complete and integrated emergency plan for VEGP Units 3 and 4 was performed by both the NRC and FEMA as part of their review of the VEGP ESP application, and is reflected in Section 13.3 of NUREG-1923. Section 13.3.3.2.6, "Emergency Communications," of NUREG-1923 describes the various communication capabilities associated with the ESP emergency plan, including communication interfaces. In Section 13.3.4, "Conclusions," of NUREG-1923, the staff concluded that the emergency plans provide an adequate expression of the overall concept of operation and describe the essential elements of advanced planning and the provisions made to cope with emergency situations. The staff's reasonable assurance finding in NUREG-1923 includes the requirement for satisfactory completion of the ITAAC. In VEGP COL FSAR Table 1.9-202, the applicant requested an exception associated with applicable ITAAC, which is addressed below under ITAAC and License Condition 1.

In regard to post-72 hour actions associated with the AP1000 DCD, the applicant referenced operating procedures and various DCD sections (see above) that address post-72 hour support actions. The staff identified additional AP1000 DCD Tier 2 sections that address post-72 hour support actions, which include Sections 6.4, "Habitability Systems"; 9.4, "Air-Conditioning, Heating, Cooling, and Ventilation System"; and 9.5, "Other Auxiliary Systems" (e.g., plant lighting systems described in Section 9.5.3).

As discussed in AP1000 DCD Section 1.9.5.4, post-72 hour support actions relate to an extended loss of the nonsafety-related systems for both offsite and onsite alternating current (ac) power sources for more than 72 hours. For purposes of the staff's review of EP information in the COL application, and in the context of COL Action Item 13.3-1, the reference to post-72 hour support actions is limited and indirectly related to the habitability and functionality of the TSC. Specifically, it is limited to the reliability of the electrical power supply (post-72 hours) to the TSC ventilation system and communications equipment. The evaluation of the reliability of the electrical power supplies, including the power supplies to the TSC, is addressed in the AP1000 DCD sections referenced above. The habitability and functionality of the TSC is addressed above in SER Section 13.3.4.2 (VEGP ESP PC 8), and in SER Section 13.3.3.2.8 of NUREG-1923.

The staff finds that the applicant has addressed EP (including communication interfaces) in support of VEGP Units 3 and 4 through incorporation by reference of the ESP emergency plan. In addition, the applicant has addressed post-72 hour actions through reference to the AP1000 DCD sections (identified above) that specifically address an extended loss of the nonsafety-related systems for both offsite and onsite ac power sources for more than 72 hours. The staff's evaluation of those systems and power sources, including the establishment of

associated operating procedures, are addressed in their respective SER sections. Therefore, the staff finds that the COL applicant has adequately addressed STD COL 13.3-1.

- STD COL 13.3-2

STD COL 13.3-2 requires that COL applicants referencing the AP1000 certified design will address the activation of the emergency operations facility (EOF), consistent with current operating practice and NUREG-0654/FEMA-REP-1. In VEGP COL FSAR Section 13.3, the applicant addressed STD COL 13.3-2 by stating that the emergency plan describes the plans for coping with emergency situations, including communications interfaces and staffing of the EOF.

Section 13.3 of NUREG-1923 includes a summary of the staff's review of the ESP application's emergency plan, which included an examination of the activation of the EOF – in support of the VEGP site for Units 3 and 4 – consistent with current operating practice and NUREG-0654/FEMA-REP-1. Activation and staffing of the EOF is described in (NUREG-1923) Section 13.3.3.2.1, "Assignment of Responsibility–Organization Control"; Section 13.3.3.2.2, "Onsite Emergency Organizations"; Section 13.3.3.2.5, "Notification Methods and Procedures"; and Section 13.3.3.2.8. Therefore, the staff finds that the COL applicant has adequately addressed STD COL 13.3-2 through incorporation by reference of the VEGP ESP emergency plan.

- ITAAC and License Condition 1

In VEGP COL FSAR Table 1.9-202, "Conformance with SRP Acceptance Criteria," the applicant identified an exception to the criteria in NUREG-0800, Section 14.3.10, "Emergency Planning – Inspections, Tests, Analyses, and Acceptance Criteria." The exception, which is reflected in VEGP SUP 14.3-1, is described in VEGP COL FSAR Section 14.3.2.3.1, "Emergency Planning ITAAC (EP-ITAAC)," as follows:

> EP-ITAAC were developed in the Early Site Permit (ESP) Application to address implementation of elements of the Emergency Plan. Site-specific EP-ITAAC are based on the generic ITAAC provided in Table 13.3-1 of SECY-05-0197. These ITAAC have been tailored to the specific reactor design and emergency planning program requirements.

The EP ITAAC appendices and tables listed below are relevant to the exception request in that the first three (i.e., Appendix E and Appendix B) are the EP ITAAC that are referenced in the VEGP Units 3 and 4 COL application (see SER Section 13.3.2, above). The last three tables provide NRC guidance in the form of a generic set of acceptable EP ITAAC that may be used by ESP or COL applicants to develop site-specific EP ITAAC – Table 14.3.10-1 of NUREG-0800 is identical to Table C.II.1-B1 of RG 1.206. Table 13.3-1 of SECY-05-0197[20] is the original draft of generic EP ITAAC, and was subsequently revised as Table 14.3.10-1 (and Table C.II.1-B1).

- VEGP ESP-004, Appendix E – VEGP Unit 3 Emergency Planning ITAAC
- VEGP ESP-004, Appendix E – VEGP Unit 4 Emergency Planning ITAAC
- COL Application, Part 10, Appendix B – (Unit 3) Acceptance Criteria 5.1.8 & 8.1.1.D.2.d
- Table 3.1-1 – AP1000 DCD, EP ITAAC
- Table 13.3-1 – SECY-05-0197, generic EP ITAAC

[20] See SECY-05-0197, October 28, 2005, and the associated Staff Requirements Memorandum (SRM).

- Table 14.3.10-1 – NUREG-0800 Section 14.3.10, generic EP ITAAC
- Table C.II.1-B1 – RG 1.206, generic EP ITAAC

Tables 14.3.10-1 and C.II.1-B1 include the ITAAC from Table 13.3-1. In addition, 20 new acceptance criteria were added to provide more flexibility and accommodate licensing of a new reactor at a new site.[21] While Table 13.3-1 includes a smaller set of ITAAC, it can still be used for licensing a new reactor at an existing reactor site (with an operational EP program), subject to whether the EP requirements associated with the 20 new acceptance criteria are fully addressed in the application. The inclusion of various site-specific EP ITAAC are optional, in that they are only needed if the ESP or COL application does not include information that fully addresses the respective EP requirement. As stated in Section I of NUREG-0800 Section 14.3.10, "EP ITAAC should be limited to those aspects of emergency planning and preparedness that can not reasonably be addressed prior to construction of the plant."

Consistent with 10 CFR 52.79(a)(41) regarding proposed alternatives to NUREG-0800 acceptance criteria, the COL application exception specifically addresses the use of SECY-05-0197 Table 13.3-1 to develop its ESP EP ITAAC in VEGP ESP-004 (including Unit 3 Acceptance Criteria 5.1.8 and 8.1.1.D.2.d), rather than NUREG-0800 Table 14.3.10-1 (or RG 1.206 Table C.II.1-B1). Further, RG 1.206 Section C.I.1.9.1, "Conformance with Regulatory Guides," referencing 10 CFR 52.79(a)(4)(i), states in part that "COL applicants should provide an evaluation of conformance with guidance in NRC regulatory guides in effect 6 months before the submittal date of the COL application." VEGP COL FSAR Appendix 1AA, "Conformance with Regulatory Guides," identifies the exception to RG 1.206 as the same exception to NUREG-0800 acceptance criteria in Table 1.9-202. Since the EP ITAAC Table C.II.1-B1 in RG 1.206 is identical to the EP ITAAC Table 14.3.10-1 in NUREG-0800, the cross reference is appropriate and acceptable.

As discussed above in SER Section 13.3.2, the COL application incorporates by reference the complete and integrated emergency plan from the VEGP ESP, which includes EP ITAAC that are based on the generic ITAAC in Table 13.3-1 of SECY-05-0197. As part of its review of the ESP application, the staff found that the site-specific EP ITAAC, required by 10 CFR 52.17(b)(3), were acceptable because the ESP emergency plan fully addressed the EP requirements associated with the generic ITAAC in Table C.II.1-B1 that were not used (i.e., not included in Table 13.3-1). The staff reviewed the relevant sections of the ESP emergency plan, and found that they were consistent with the applicable guidance, and therefore, met the associated requirements (see Section 13.3 of NUREG-1923).

In proposed License Condition 1, the applicant incorporated the EP ITAAC identified in Appendix B to Part 10 of the COL application, which includes (1) the EP ITAAC in Appendix E of VEGP ESP-004; (2) an additional EP Acceptance Criterion 5.1.8; and (3) the AP1000 DCD Tier 1 ITAAC, which consists of the EP ITAAC. In addition, in a letter dated, November 2, 2010, the applicant proposed an additional Unit 3 Acceptance Criterion 8.1.1.D.2.d, which addressed the demonstration of the capability of TSC and EOF equipment and data displays to clearly identify and reflect the affected unit. The staff reviewed this acceptance criterion and found it acceptable because it is consistent with NUREG-0800. The staff concludes that the complete set of EP ITAAC for VEGP Units 3 and 4 consists of the EP ITAAC in SER Table 13.3-1 and SER Table 13.3-2, "VEGP Unit 4 ITAAC," respectively (provided below) – which include Acceptance Criteria 5.1.8 and 8.1.1.D.2.d in SER Table 13.3-1 – plus the EP ITAAC in AP1000 DCD Tier 1 Table 3.3-1.

[21] Footnote 2 of NUREG-0800 Table 14.3.10-1 identifies the distinction between Table 14.3.10-1 and Table 13.3-1.

The staff concludes that the referenced EP ITAAC in Table 3.1-1 of AP1000 DCD and Appendix E of VEGP ESP-004 (including Acceptance Criteria 5.1.8 and 8.1.1.D.2.d), are adequate and conform to the respective acceptance criteria in Section 14.3.10 of NUREG-0800. As discussed above, the applicant's use of Table 13.3-1 of SECY-05-0197 to develop the site-specific EP ITAAC provides an acceptable method of complying with the relevant regulations (i.e., 10 CFR 52.17(b)(3)) that underlie the corresponding acceptance criteria in NUREG-0800, Section 14.3.10. Therefore, the staff finds that the exception (proposed alternative) to the criteria in NUREG-0800, Section 14.3.10, is acceptable because it adequately addresses the relevant guidance and acceptance criteria, and therefore, meets the requirements of 10 CFR 52.79(a)(41).

- 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.

13.3.4.5 *Supplemental Information*

- STD SUP 13.3-1

Activities that the COL holder (i.e., licensee) shall perform after the COL is issued, that are applicable to emergency planning, consist of the implementation milestones and license conditions listed below. In Table 13.4-201 of FSAR Section 13.4, "Operational Programs," the applicant listed operational programs required by NRC regulations. The EP program is identified as Operational Program (Item) No. 14, and includes the associated implementation milestones. The staff reviewed Table 13.4-201, and finds that the proposed implementation milestones associated with the EP program are acceptable because they are consistent with the relevant guidance and acceptance criteria in NUREG-0800, and therefore meet the respective requirements in Appendix E of 10 CFR Part 50 (see also, SER Section 13.4).

Implementation Milestones

- A full participation exercise conducted within 2 years of the scheduled date for initial loading of fuel, as required by Section IV.F.2(a)(ii) of Appendix E to 10 CFR Part 50.

- Onsite exercise conducted within 1 year before the scheduled date for initial loading of fuel, as required by Section IV.F.2(a)(ii) of Appendix E to 10 CFR Part 50.

- Licensee's detailed implementing procedures for its emergency plan submitted at least 180 days prior to the scheduled date for initial loading of fuel, as required by Section V of Appendix E to 10 CFR Part 50.

13.3.5 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 (13-3) – The licensee shall submit a fully developed set of plant-specific Emergency Action Levels (EALs) for VEGP Units 3 and 4 in accordance with NEI 07-01, "Methodology for Development of Emergency Action Levels, Advanced Passive Light Water Reactors," Revision 0, with no deviations. 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.

- License Condition (13-4) – 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 inspection 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.

For the reasons discussed in the technical evaluation section above, the staff proposes to include the following EP ITAAC:

- The licensee shall perform and satisfy the acceptance criteria of the EP ITAAC set forth in SER Tables 13.3-1 and 13.3-2.

13.3.6 Conclusion

The NRC staff reviewed the application, including applicable portions of the referenced VEGP ESP SSAR and AP1000 DCD. The staff confirmed that the applicant addressed the required information relating to emergency planning, and there is no additional information needed to support the VEGP COL application. The results of the staff's technical evaluation of the information incorporated by reference in the application are documented in NUREG-1793 and its supplements for the DCD, and in NUREG-1923 for the ESP.

The EP ITAAC that are applicable to VEGP Units 3 and 4 are provided below in SER Tables 13.3-1 and 13.3-2, respectively. The staff concludes that, pursuant to 10 CFR 52.80(a), the applicant included in the VEGP COL application 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.

As part of its review of the VEGP ESP application, FEMA provided its findings and determinations concerning the adequacy of offsite EP and preparedness, which are based on its review of State and local emergency plans. FEMA concluded that the offsite State and local emergency plans are adequate to cope with an incident at VEGP, and there is reasonable assurance that these plans can be implemented. As part of its review of the VEGP COL application, FEMA subsequently concluded that the findings and determinations made for the ESP application for VEGP remain unchanged for the COL application. On the basis of its review of the FEMA findings and determinations, the staff concludes that the State and local emergency plans are adequate, and there is reasonable assurance that they can be implemented.

Based on its evaluation, the staff concludes that the onsite emergency plan establishes an adequate planning basis for an acceptable state of onsite emergency preparedness, and there is reasonable assurance that the plan can be implemented.

Based on FEMA's conclusions and the staff's evaluation, the staff concludes that the emergency plans provide an adequate expression of the overall concept of operation and describe the essential elements of advanced planning and the provisions made to cope with emergency situations. Therefore, the staff concludes that the overall state of onsite and offsite emergency preparedness, when fully implemented, will meet the requirements of 10 CFR 50.33(g), 10 CFR 50.47, Appendix E to 10 CFR Part 50, 10 CFR 52.39(d), 10 CFR 52.77, 10 CFR 52.79(a)(21), 10 CFR 52.79(a)(22)(i), 10 CFR 52.79(b)(4), 10 CFR 52.80, 10 CFR 52.93(b), and 10 CFR 100.21.

Further, in accordance with 10 CFR 50.47(a), the staff concludes that, subject to the required conditions and limitations of the full-power license, including the license conditions listed in Section 13.3.5 of this SER, there is reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency at the VEGP site, and that emergency preparedness at VEGP Units 3 and 4 is adequate to support full-power operations.

Table 13.3-1. VEGP Unit 3 ITAAC (continued)

Planning Standard	EP Program Elements (From NUREG-0654/FEMA-REP-1)	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 plans call for reliance on information provided by facility licensees for determinations of minimum initial offsite response measures.	1.1 An emergency classification and emergency action level (EAL) scheme must be established by the licensee. The specific instruments, parameters, or equipment status shall be shown for establishing each emergency class, in the in-plant emergency procedures. The plan shall identify the parameter values and equipment status for each emergency class. [D.1]	1.1.1 An inspection of the control room, technical support center (TSC), and emergency operations facility (EOF) will be performed to verify that the displays for retrieving system and effluent parameters specified in Table Annex V2 D.2-1, *Hot Initiating Condition Matrix, Modes 1, 2, 3, and 4*; Table V2 D.2-2, *Cold Initiating Condition Matrix, Modes 5, 6, and De-fueled*; are installed and perform their intended functions; and that emergency implementing procedures (EIPs) have been completed. 1.1.2 An analysis of the EAL technical bases will be performed to verify as-built, site-specific implementation of the EAL scheme.	1.1.1 The parameters specified in Table Annex V2 H-1, *Post Accident Monitoring Variables*, are retrievable in the control room, TSC, and EOF. The ranges of values of these parameters that can be displayed encompass the values specified in the emergency classification and EAL scheme. 1.1.2 The EAL scheme is consistent with Regulatory Guide 1.101, “Emergency Planning and Preparedness for Nuclear Power Reactors.”
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 between the control room, OSC, TSC, EOF, principal State and local emergency operations centers (EOCs), and radiological field monitoring teams. [F.1.d]	3.1 A test will be performed of the communications capabilities between the control room, OSC, TSC and EOF, and to the State and local EOCs, and radiological field monitoring teams.	3.1 Communications are established between the control room, OSC, TSC, and EOF. Communications are established between the control room, TSC, and Georgia Emergency Management Agency (GEMA) Operation Center; Burke County Emergency Operation Center (EOC); SRS Operations Center; South Carolina Warning Point; and Aiken, Allendale, and Barnwell County Dispatchers. Communications are established between the TSC and radiological monitoring teams.

Table 13.3-1. VEGP Unit 3 ITAAC (continued)

Planning Standard	EP Program Elements (From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
	3.2 The means exists for communications from the control room, TSC, and EOF to the NRC headquarters and regional office EOC, including establishment of the Emergency Response Data System (ERDS) between the onsite computer system and the NRC Operations Center. [F.1.f]	3.2 A test will be performed of the communications capabilities from the control room, TSC and EOF to the NRC, including ERDS.	3.2 Communications are established from the control room, TSC, and EOF to the NRC headquarters and regional office EOCs, and an access port for the Emergency Response Data System (ERDS) is provided.
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 technical support center (TSC) and an onsite operations support center (OSC). [H.1]	5.1 An inspection of the as-built TSC and OSC will be performed, including a test of the capabilities.	5.1.1 The TSC has at least 2,175 square feet of floor space. 5.1.2 Communication equipment is installed in the TSC and OSC, and voice transmission and reception are accomplished. 5.1.3 The plant parameters listed in Table Annex V2 H-1, *Post Accident Monitoring Values*, can be retrieved and displayed in the TSC. 5.1.4 The TSC is located within the protected area, and no major security barriers exist between the TSC and the control room. 5.1.5 The OSC is located adjacent to the passage from the annex building to the control room. 5.1.6 The TSC ventilation system includes a high-efficiency particulate air (HEPA) and charcoal filter, and radiation monitors are installed. 5.1.7 A reliable and backup electrical power supply is available for the TSC.

Table 13.3-1. VEGP Unit 3 ITAAC (continued)

Planning Standard	EP Program Elements (From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			5.1.8 Controls and displays exist in the TSC to control and monitor the status of the TSC ventilation system including heating and cooling, and the activation of the high-efficiency particulate air (HEPA) and charcoal filter system upon detection of high radiation in the TSC.
	5.2 The licensee has established an emergency operations facility (EOF). [H.2]	5.2 An inspection of the EOF will be performed, including a test of the capabilities.	5.2.1 Voice transmission and reception are accomplished between the EOF and the control room. 5.2.2 The plant parameters listed in Table Annex V2 H-1, *Post Accident Monitoring Values*, can be retrieved and displayed 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 of the emergency plan will be conducted by performing a drill to verify the capability to perform accident assessment.	6.1 Using selected monitoring parameters listed in Table Annex V2 H-1 of the VEGP emergency plan, simulated degraded plant conditions are assessed and protective actions are initiated in accordance with the following criteria: A. *Accident Assessment and Classification* 1. Demonstrate the ability to identify initiating conditions, determine emergency action level (EAL) parameters, and correctly classify the emergency throughout the drill. B. *Radiological Assessment and Control* 1. Demonstrate the ability to obtain onsite radiological surveys and samples.

Table 13.3-1. VEGP Unit 3 ITAAC (continued)

Planning Standard	EP Program Elements (From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			2. Demonstrate the ability to continuously monitor and control radiation exposure to emergency workers. 3. Demonstrate the ability to assemble and deploy field monitoring teams within 60 minutes from the decision to do so. 4. Demonstrate the ability to satisfactorily collect and disseminate field team data. 5. Demonstrate the ability to develop dose projections. 6. Demonstrate the ability to make the decision whether to issue radio-protective drugs (KI) to emergency workers. 7. Demonstrate the ability to develop appropriate protective action recommendations (PARs) and notify appropriate authorities within 15 minutes of development.
	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 radioactive materials based on plant system parameters and effluent monitors. [I.3]	6.2 An analysis of the emergency implementing procedures (EIPs) and the Offsite Dose Calculation Manual (ODCM) will be completed to verify ability to determine the source term and magnitude of releases.	6.2 The EIPs and ODCM correctly calculate source terms and magnitudes of postulated releases.

Table 13.3-1. VEGP Unit 3 ITAAC (continued)

Planning Standard	EP Program Elements (From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
	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 An analysis of the emergency implementing procedures (EIPs) and the Offsite Dose Calculation Manual (ODCM) will be completed to verify the relationship between effluent monitor readings, and onsite and offsite exposures and contamination.	6.3 The EIPs and ODCM calculate the relationship between effluent monitor readings, and onsite and offsite exposures and contamination.
	6.4 The means exists to acquire and evaluate meteorological information. [I.5]	**6.4 A test will be performed to verify the ability to access meteorological information in the TSC and control room.**	**6.4 The following parameters are displayed in the TSC and control room:** • **Wind speed (at 10 and 60 meters)** • **Wind direction (at 10 and 60 meters)** • **Standard deviation of horizontal wind direction (at 10 meters)** • **Vertical temperature difference (between 10 and 60 meters)** • **Ambient temperature (at 10 meters)** • **Dew-point temperature (at 10 meters)** • **Precipitation (at the tower base)**
	6.5 The means exists to make rapid assessments of actual or potential magnitude and locations of any radiological hazards through liquid or gaseous release pathways, including activation, notification means, field team composition, transportation,	6.5 A test will be performed of the capabilities to make rapid assessment of actual or potential radiological hazards through liquid or gaseous release pathways.	6.5 Demonstrate the capability to make rapid assessment of actual or potential magnitude and locations of any radiological hazards through liquid or gaseous release pathways.

Table 13.3-1. VEGP Unit 3 ITAAC (continued)

Planning Standard	EP Program Elements (From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
	communication, monitoring equipment, and estimated deployment times. [I.8]		
	6.6 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]	6.6 An analysis of the methodology contained in the emergency implementing procedures (EIPs) for estimating dose and preparing protective action recommendations (PARs), and in the Offsite Dose Calculation Manual (ODCM) will be performed to verify the ability to estimate an integrated dose from projected and actual dose rates.	6.6 The EIPs and ODCM estimate an integrated dose.
7.0 Protective Response			
10 CFR 50.47(b)(10) – A range of protective actions has been developed for the plume exposure pathway 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 pathway 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: • Employees not having emergency assignments • Visitors • Contractor and construction personnel • Other persons who may be in the public access areas, on or passing through the site, or within the owner controlled area [J.1]	7.1 A test of the onsite warning and communication capability emergency implementing procedures (EIPs) including protective action guidelines, assembly and accountability, and site dismissal will be performed during a drill.	7.1.1 Demonstrate the capability to direct and control emergency operations. 7.1.2 Demonstrate the ability to transfer emergency direction from the control room (simulator) to the technical support center (TSC) within 30 minutes from activation. 7.1.3 Demonstrate the ability to prepare for around-the-clock staffing requirements. 7.1.4 Demonstrate the ability to perform assembly and accountability for all onsite individuals within 30 minutes of an emergency requiring protected area assembly and accountability. 7.1.5 Demonstrate the ability to perform site dismissal.
8.0 Exercises and Drills			
10 CFR 50.47(b)(14) – Periodic exercises are (will be) conducted to evaluate major portions of	8.1 The licensee conducts a full participation exercise to evaluate major portions of emergency response	8.1 A full participation exercise (test) will be conducted within the specified time periods of 10 CFR Part 50,	8.1.1 The exercise is completed within the specified time periods of Appendix E to 10 CFR Part 50, onsite exercise

Table 13.3-1. VEGP Unit 3 ITAAC (continued)

Planning Standard	EP Program Elements (From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
emergency response capabilities, periodic drills are (will be) conducted to develop and maintain key skills, and deficiencies identified as a result of exercises or drills are (will be) corrected.	capabilities, which includes participation by each State and local agency within the plume exposure EPZ, and each State within the ingestion pathway EPZ. [N.1]	Appendix E.	objectives listed below have been met and there are no uncorrected onsite exercise deficiencies. A. *Accident Assessment and Classification* 1. Demonstrate the ability to identify initiating conditions, determine emergency action level (EAL) parameters, and correctly classify the emergency throughout the exercise Standard Criteria: a. Determine the correct highest 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 identified. B. *Notifications* 1. Demonstrate the ability to alert, notify, and mobilize site emergency response personnel. Standard Criteria: a. Complete the designated checklist and perform the announcement within 5 minutes of the initial event classification for an Alert or higher. b. Activate the emergency recall system within 5 minutes of the initial event classification for an Alert or higher.

Table 13.3-1. VEGP Unit 3 ITAAC (continued)

Planning Standard	EP Program Elements (From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			2. Demonstrate the ability to notify responsible State and local government agencies within 15 minutes and the NRC within 60 minutes after declaring an emergency. Standard Criteria: a. Transmit information using the designated checklist, in accordance with approved emergency implementing procedures (EIPs), within 15 minutes of event classification. b. Transmit information using the designated checklist, in accordance with approved EIPs, within 60 minutes of last transmittal for a follow-up notification to State and local authorities. c. Transmit information using the designated checklist within 60 minutes of event classification for an initial notification of the NRC. 3. Demonstrate the ability to warn or advise onsite individuals of emergency conditions. Standard Criteria: a. Initiate notification of onsite individuals (via plant page or telephone), using the designated checklist within 15 minutes of notification. 4. Demonstrate the capability of the Prompt Notification System (PNS), for the public, to operate properly when required.

Table 13.3-1. VEGP Unit 3 ITAAC (continued)

Planning Standard	EP Program Elements (From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			Standard Criteria: a. 90% of the sirens operate properly, as indicated by the Whelen feedback system. b. A NOAA tone alert radio is activated. C. *Emergency Response* 1. Demonstrate the capability to direct and control emergency operations. Standard Criteria: a. Command and control is demonstrated by the control room in the early phase of the emergency and the technical support center (TSC) within 60 minutes from TSC activation. 2. Demonstrate the ability to transfer emergency direction from the control room (simulator) to the TSC within 30 minutes from activation. Standard Criteria: a. Briefings were conducted prior to turnover responsibility. Personnel document transfer of duties. 3. Demonstrate the ability to prepare for around-the-clock staffing requirements. Standard Criteria: a. Complete 24-hour staff assignments.

Table 13.3-1. VEGP Unit 3 ITAAC (continued)

Planning Standard	EP Program Elements (From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			4. Demonstrate the ability to perform assembly and accountability for all onsite individuals within 30 minutes of an emergency requiring protected area assembly and accountability. Standard Criteria: a. Protected area personnel assembly and accountability completed within 30 minutes of the Alert or higher emergency declaration via public address announcement. D. *Emergency Response Facilities* 1. Demonstrate activation of the operational support center (OSC), and full functional operation of the TSC and EOF within 60 minutes of activation. Standard Criteria: a. The TSC, OSC, and EOF are activated within about 60 minutes of the initial notification. 2. Demonstrate the adequacy of equipment, security provisions, and habitability precautions for the TSC, OSC, EOF, and emergency news center (ENC), as appropriate. Standard Criteria: a. Demonstrate the adequacy of the emergency equipment in the emergency response facilities, including availability and general consistency with emergency implementing procedures

Table 13.3-1. VEGP Unit 3 ITAAC (continued)

Planning Standard	EP Program Elements (From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			(EIPs). b. The Security Shift Captain implements and follows applicable EIPs. c. The Health Physics Supervisor (TSC) implements the designated checklist if an onsite or offsite release has occurred. d. 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 all emergency support resources. Standard Criteria: a. Emergency response communications listed in emergency implementing procedures (EIPs) are available and operational. b. Communications systems are tested in accordance with TSC, OSC, and EOF activation checklists. c. Emergency response facility personnel are able to operate all specified communication systems. d. Clear primary and backup communications links are established and maintained for the duration of the exercise. E. *Radiological Assessment and*

Table 13.3-1. VEGP Unit 3 ITAAC (continued)

Planning Standard	EP Program Elements (From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			Control 1. Demonstrate the ability to obtain onsite radiological surveys and samples. Standard Criteria: a. HP Technicians demonstrate the ability to obtain appropriate instruments (range and type) and take surveys. b. Airborne samples are taken when the conditions indicate the need for the information. 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 Director authorizes emergency limits). b. Exposure records are available, either from the ALARA computer or a hard copy dose report. c. Emergency workers include Security and personnel within all emergency facilities. 3. Demonstrate the ability to assemble and deploy field monitoring teams within 60 minutes from the decision to do so.

Table 13.3-1. VEGP Unit 3 ITAAC (continued)

Planning Standard	EP Program Elements (From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			Standard Criteria: a. One field monitoring team is ready to be deployed within 60 minutes of being requested from the OSC, and no later than 90 minutes from the declaration of an Alert or higher emergency. 4. Demonstrate the ability to satisfactorily collect and disseminate field team data. Standard Criteria: a. Field team data to be collected is dose rate or counts per minute (cpm) from the plume, both open and closed window, and air sample (gross/net cpm) for particulate and iodine, if applicable. b. Satisfactory data dissemination is from the field team to the Dose Assessment Supervisor, via the field team communicator and field team coordinator. 5. Demonstrate the ability to develop dose projections. Standard Criteria: a. The on-shift HP/Chemistry Shared Foreman or Dose Assessment Supervisor performs timely and accurate dose projections, in accordance with emergency implementing procedures (EIPs). 6. Demonstrate the ability to make the

Table 13.3-1. VEGP Unit 3 ITAAC (continued)

Planning Standard	EP Program Elements (From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			decision whether to issue radioprotective drugs (KI) to emergency workers. Standard Criteria: a. KI is taken (simulated) if the estimated dose to the thyroid will exceed 25 rem committed dose equivalent (CDE). 7. Demonstrate the ability to develop appropriate protective action recommendations (PARs) and notify appropriate authorities within 15 minutes of development. Standard Criteria: a. Total effective dose equivalent (TEDE) and CDE dose projections from the dose assessment computer code are compared to emergency implementing procedures (EIPs). b. PARs are developed within 15 minutes of data availability. c. PARs are transmitted to responsible State and local government agencies via voice or fax within 15 minutes of PAR development. F. *Public Information* 1. Demonstrate the capability to develop and disseminate clear, accurate, and timely information to the news media, in accordance with EIPs.

Table 13.3-1. VEGP Unit 3 ITAAC (continued)

Planning Standard	EP Program Elements (From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			Standard Criteria: a. Media information (e.g., press releases, press briefings, electronic media) is made available within 60 minutes of notification of the on-call media representative. b. Follow-up information is provided, at a minimum, within 60 minutes of an emergency classification or PAR change. 2. Demonstrate the capability to establish and effectively operate rumor control in a coordinated fashion. Standard Criteria: a. Calls are answered in a timely manner with the correct information, in accordance with EIPs. b. Calls are returned or forwarded, as appropriate, to demonstrate responsiveness. c. Rumors are identified and addressed. G. *Evaluation* 1. Demonstrate the ability to conduct a post-exercise critique, to determine areas requiring improvement and corrective action. Standard Criteria: a. An exercise time line is developed, followed by an evaluation of the

Table 13.3-1. VEGP Unit 3 ITAAC (continued)

Planning Standard	EP Program Elements (From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			objectives. b. Significant problems in achieving the objectives are discussed to ensure understanding of why objectives were not fully achieved. c. Recommendations for improvement in non-objective areas are discussed. 8.1.2 Onsite emergency response personnel are mobilized in sufficient number to fill the emergency positions identified in emergency plan Section B, *VEGP Emergency Organization*, and they successfully perform their assigned responsibilities as outlined in Acceptance Criterion 8.1.1.D, *Emergency Response Facilities*. 8.1.3 The exercise is completed within the specified time periods of Appendix E to 10 CFR Part 50, offsite exercise objectives have been met, and there are no uncorrected offsite deficiencies, or a license condition requires offsite deficiencies will be corrected prior to operation above 5 percent of rated power.
9.0 Implementing Procedures			
10 CFR Part 50, Appendix 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 has submitted detailed emergency implementing procedures (EIPs) for the onsite emergency plan no less than 180 days prior to fuel load.

Table 13.3-2. VEGP Unit 4 ITAAC (continued)

Planning Standard	EP Program Elements(From NUREG-0654/FEMA-REP-1)	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 plans call for reliance on information provided by facility licensees for determinations of minimum initial offsite response measures.	1.1 An emergency classification and emergency action level (EAL) scheme must be established by the licensee. The specific instruments, parameters, or equipment status shall be shown for establishing each emergency class, in the in-plant emergency procedures. The plan shall identify the parameter values and equipment status for each emergency class. [D.1]	1.1.1 An inspection of the control room will be performed to verify that the displays for retrieving system and effluent parameters specified in Table Annex V2 D.2-1, *Hot Initiating Condition Matrix, Modes 1, 2, 3, and 4*; Table V2 D.2-2, *Cold Initiating Condition Matrix, Modes 5, 6, and De-fueled*; are installed and perform their intended functions; and that emergency implementing procedures (EIPs) have been completed. 1.1.2 An analysis of the EAL technical bases will be performed to verify as-built, site-specific implementation of the EAL scheme.	1.1.1 The parameters specified in Table Annex V2 H-1, *Post Accident Monitoring Variables*, are retrievable in the control room. The ranges of values of these parameters that can be displayed encompass the values specified in the emergency classification and EAL scheme. 1.1.2 The EAL scheme is consistent with Regulatory Guide 1.101, "Emergency Planning and Preparedness for Nuclear Power Reactors."
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 between the control room, OSC, TSC, and EOF. [F.1.d]	3.1 A test will be performed of the communications capabilities between the control room, OSC, TSC and EOF, and to the State and local EOCs.	3.1 Communications are established between the control room, OSC, TSC, and EOF. Communications are established between the control room, Georgia Emergency Management Agency (GEMA) Operation Center; Burke County Emergency Operations Center (EOC); SRS Operations Center; South Carolina Warning Point; and Aiken, Allendale, and Barnwell County Dispatchers.
	3.2 The means exists for communications from the control room to the NRC headquarters and regional office EOC. [F.1.f]	3.2 A test will be performed of the communications capabilities from the control room, TSC and EOF to the NRC, including ERDS.	3.2 Communications are established from the control room, TSC, and EOF, to the NRC headquarters and regional office EOCs, and an access port for the Emergency Response Data System (ERDS) is provided.

Table 13.3-2. VEGP Unit 4 ITAAC (continued)

Planning Standard	EP Program Elements(From NUREG-0654/FEMA-REP-1)	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 an onsite operations support center (OSC). [H.1]	5.1 An inspection of the as-built OSC will be performed, including a test of the capabilities.	5.1.1 Communication equipment is installed in the OSC, and voice transmission and reception are accomplished. 5.1.2 The plant parameters listed in Table Annex V2 H-1, *Post Accident Monitoring Values*, can be retrieved and displayed in the TSC. 5.1.3 The OSC is located adjacent to the passage from the annex building to the control room.
	5.2 The licensee has established an emergency operations facility (EOF). [H.2]	5.2 An inspection of the EOF will be performed, including a test of the capabilities.	5.2.1 Voice transmission and reception are accomplished between the EOF and the control room. 5.2.2 The plant parameters listed in Table Annex V2 H-1, *Post Accident Monitoring Values*, can be retrieved and displayed 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 of the emergency plan will be conducted by performing a drill to verify the capability to perform accident assessment.	6.1 Using selected monitoring parameters listed in Table Annex V2 H-1 of the VEGP emergency plan, simulated degraded plant conditions are assessed and protective actions are initiated in accordance with the following criteria: A. *Accident Assessment and Classification* 1. Demonstrate the ability to identify initiating conditions, determine emergency action level (EAL) parameters, and correctly classify the emergency throughout the drill.

Table 13.3-2. VEGP Unit 4 ITAAC (continued)

Planning Standard	EP Program Elements(From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			B. *Radiological Assessment and Control* 1. Demonstrate the ability to obtain onsite radiological surveys and samples. 2. Demonstrate the ability to continuously monitor and control radiation exposure to emergency workers. 3. Demonstrate the ability to assemble and deploy field monitoring teams within 60 minutes from the decision to do so. 4. Demonstrate the ability to satisfactorily collect and disseminate field team data. 5. Demonstrate the ability to develop dose projections. 6. Demonstrate the ability to make the decision whether to issue radio-protective drugs (KI) to emergency workers. 7. Demonstrate the ability to develop appropriate protective action recommendations (PARs) and notify appropriate authorities within 15 minutes of development.
	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 radioactive materials based on plant system parameters and effluent monitors. [I.3]	6.2 An analysis of the emergency implementing procedures (EIPs) and the Offsite Dose Calculation Manual (ODCM) will be completed to verify ability to determine the source term and magnitude of releases.	6.2 The EIPs and ODCM correctly calculate source terms and magnitudes of postulated releases.

Table 13.3-2. VEGP Unit 4 ITAAC (continued)

Planning Standard	EP Program Elements(From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
	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 An analysis of the emergency implementing procedures (EIPs) and the Offsite Dose Calculation Manual (ODCM) will be completed to verify the relationship between effluent monitor readings, and onsite and offsite exposures and contamination.	6.3 The EIPs and ODCM calculate the relationship between effluent monitor readings, and onsite and offsite exposures and contamination.
	6.4 The means exists to acquire and evaluate meteorological information. [I.5]	6.4 A test will be performed to verify the ability to access meteorological information in the TSC and control room.	6.4 The following parameters are displayed in the TSC and control room: • Wind speed (at 10 and 60 meters) • Wind direction (at 10 and 60 meters) • Standard deviation of horizontal wind direction (at 10 meters) • Vertical temperature difference (between 10 and 60 meters) • Ambient temperature (at 10 meters) • Dew-point temperature (at 10 meters) • Precipitation (at the tower base)
	6.5 The means exists to make rapid assessments of actual or potential magnitude and locations of any 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 radiological hazards through liquid or gaseous release pathways.	6.5 Demonstrate the capability to make rapid assessment of actual or potential magnitude and locations of any radiological hazards through liquid or gaseous release pathways.

Table 13.3-2. VEGP Unit 4 ITAAC (continued)

Planning Standard	EP Program Elements(From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
	6.6 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]	6.6 An analysis of the methodology contained in the emergency implementing procedures (EIPs) for estimating dose and preparing protective action recommendations (PARs), and in the Offsite Dose Calculation Manual (ODCM) will be performed to verify the ability to estimate an integrated dose from projected and actual dose rates.	6.6 The EIPs and ODCM estimate an integrated dose.
7.0 Protective Response			
10 CFR 50.47(b)(10) – A range of protective actions has been developed for the plume exposure pathway 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 pathway 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: • Employees not having emergency assignments • Visitors • Contractor and construction personnel • Other persons who may be in the public access areas, on or passing through the site, or within the owner controlled area [J.1]	7.1 A test of the onsite warning and communication capability emergency implementing procedures (EIPs) including protective action guidelines, assembly and accountability, and site dismissal will be performed during a drill.	7.1.1 Demonstrate the capability to direct and control emergency operations. 7.1.2 Demonstrate the ability to transfer emergency direction from the control room (simulator) to the technical support center (TSC) within 30 minutes of activation. 7.1.3 Demonstrate the ability to prepare for around-the-clock staffing requirements. 7.1.4 Demonstrate the ability to perform assembly and accountability for all onsite individuals within 30 minutes of an emergency requiring protected area assembly and accountability. 7.1.5 Demonstrate the ability to perform site dismissal.
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)	8.1 The licensee conducts a limited participation exercise to evaluate portions of emergency response capabilities, which includes participation by each State and local agency within	8.1 A limited participation exercise (test) will be conducted within the specified time periods of 10 CFR Part 50, Appendix E.	8.1.1 The exercise is completed within the specified time periods of Appendix E to 10 CFR Part 50, onsite exercise objectives listed below have been met and there are no uncorrected onsite

Table 13.3-2. VEGP Unit 4 ITAAC (continued)

Planning Standard	EP Program Elements(From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
conducted to develop and maintain key skills, and deficiencies identified as a result of exercises or drills are (will be) corrected.	the plume exposure EPZ that have not been tested in a previous exercise. [N.1]		exercise deficiencies. A. *Accident Assessment and Classification* 1. Demonstrate the ability to identify initiating conditions, determine emergency action level (EAL) parameters, and correctly classify the emergency throughout the exercise Standard Criteria: a. Determine the correct highest 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 identified. B. *Notifications* 1. Demonstrate the ability to alert, notify, and mobilize site emergency response personnel. Standard Criteria: a. Complete the designated checklist and perform the announcement within 5 minutes of the initial event classification for an Alert or higher. b. Activate the emergency recall system within 5 minutes of the initial event classification for an Alert or higher. 2. Demonstrate the ability to notify responsible State and local government

Table 13.3-2. VEGP Unit 4 ITAAC (continued)

Planning Standard	EP Program Elements(From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			agencies within 15 minutes and the NRC within 60 minutes after declaring an emergency. Standard Criteria: a. Transmit information using the designated checklist, in accordance with approved emergency implementing procedures (EIPs), within 15 minutes of event classification. b. Transmit information using the designated checklist, in accordance with approved EIPs, within 60 minutes of last transmittal for a follow-up notification to State and local authorities. c. Transmit information using the designated checklist within 60 minutes of event classification for an initial notification of the NRC. 3. Demonstrate the ability to warn or advise onsite individuals of emergency conditions. Standard Criteria: a. Initiate notification of onsite individuals (via plant page or telephone) using the designated checklist, within 15 minutes of notification. C. *Emergency Response* 1. Demonstrate the capability to direct and control emergency operations.

Table 13.3-2. VEGP Unit 4 ITAAC (continued)

Planning Standard	EP Program Elements(From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			Standard Criteria: a. Command and control is demonstrated by the control room in the early phase of the emergency and by the TSC within 60 minutes from activation. 2. Demonstrate the ability to transfer emergency direction from the control room (simulator) to the TSC within 30 minutes from activation. Standard Criteria: a. Briefings were conducted prior to turnover responsibility. Personnel document transfer of duties. 3. Demonstrate the ability to prepare for around-the-clock staffing requirements. Standard Criteria: a. Complete 24-hour staff assignments. 4. Demonstrate the ability to perform assembly and accountability for all onsite individuals within 30 minutes of an emergency requiring protected area assembly and accountability. Standard Criteria: a. Protected area personnel assembly and accountability completed within 30 minutes of the Alert or higher emergency declaration via public address announcement.

Table 13.3-2. VEGP Unit 4 ITAAC (continued)

Planning Standard	EP Program Elements(From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			D. *Emergency Response Facilities* 1. Demonstrate timely activation of the OSC. Standard Criteria: a. The OSC is activated within about 60 minutes of the initial notification. 2. Demonstrate the adequacy of equipment, security provisions, and habitability precautions for the OSC, as appropriate. Standard Criteria: a. Demonstrate the adequacy of the emergency equipment in the emergency response facilities, including availability and general consistency with emergency implementing procedures (EIPs). b. The Security Shift Captain implements and follows applicable EIPs. c. The Health Physics Supervisor (TSC) implements the designated checklist if an onsite or offsite release has occurred. 3. Demonstrate the adequacy of communications for all emergency support resources. Standard Criteria: a. Emergency response

Table 13.3-2. VEGP Unit 4 ITAAC (continued)

Planning Standard	EP Program Elements(From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			communications listed in emergency implementing procedures (EIPs) are available and operational. b. Communications systems are tested in accordance with OSC activation checklist. c. Emergency response facility personnel are able to operate all specified communication systems. d. Clear primary and backup communications links are established and maintained 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. HP Technicians demonstrate the ability to obtain appropriate instruments (range and type) and take surveys. b. Airborne samples are taken when the conditions indicate the need for the information. 2. Demonstrate the ability to continuously monitor and control radiation exposure to emergency workers. Standard Criteria:

Table 13.3-2. VEGP Unit 4 ITAAC (continued)

Planning Standard	EP Program Elements(From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance 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 Director authorizes emergency limits). b. Exposure records are available, either from the ALARA computer or a hard copy dose report. c. Emergency workers include Security and personnel within all emergency facilities. 3. Demonstrate the ability to assemble and deploy field monitoring teams within 60 minutes from the decision to do so. Standard Criteria: a. One field monitoring team is ready to be deployed within 60 minutes of being requested from the OSC, and no later than 90 minutes from the declaration of an Alert or higher emergency. 4. Demonstrate the ability to satisfactorily collect and disseminate field team data. Standard Criteria: a. Field team data to be collected is dose rate or counts per minute (cpm) from the plume, both open and closed window, and air sample (gross/net cpm) for particulate and iodine, if applicable.

Table 13.3-2. VEGP Unit 4 ITAAC (continued)

Planning Standard	EP Program Elements(From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			b. Satisfactory data dissemination is from the field team to the Dose Assessment Supervisor, via the field team communicator and field team coordinator. 5. Demonstrate the ability to develop dose projections. Standard Criteria: a. The on-shift HP/Chemistry Shared Foreman or Dose Assessment Supervisor performs timely and accurate dose projections, in accordance with emergency implementing procedures (EIPs). 6. Demonstrate the ability to develop appropriate protective action recommendations (PARs) and notify appropriate authorities within 15 minutes of development. Standard Criteria: a. Total effective dose equivalent (TEDE) and CDE dose projections from the dose assessment computer code are compared to emergency implementing procedures (EIPs). b. PARs are developed within 15 minutes of data availability. c. PARs are transmitted to responsible State and local government agencies via voice or fax within 15 minutes of PAR development.

Table 13.3-2. VEGP Unit 4 ITAAC

Planning Standard	EP Program Elements(From NUREG-0654/FEMA-REP-1)	Inspections, Tests, Analyses	Acceptance Criteria
			8.1.2 Onsite emergency response personnel are mobilized in sufficient number to fill the emergency positions identified in emergency plan Section B, *VEGP Emergency Organization,* and they successfully perform their assigned responsibilities as outlined in Acceptance Criterion 8.1.1.D, *Emergency Response Facilities*. 8.1.3 The exercise is completed within the specified time periods of Appendix E to 10 CFR Part 50, offsite exercise objectives have been met, and there are no uncorrected offsite deficiencies, or a license condition requires offsite deficiencies will be corrected prior to operation above 5 percent of rated power.
9.0 Implementing Procedures			
10 CFR Part 50, Appendix 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 plans 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 has submitted detailed emergency implementing procedures (EIPs) for the onsite emergency plan no less than 180 days prior to fuel load.

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, dated October 28, 2005, 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 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 13.4 of the AP1000 DCD, Revision 19.

In addition, in VEGP COL FSAR Section 13.4 and in Part 10 of the VEGP COL application, "Proposed License Conditions (Including 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. 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 the FSER related to the DCD.

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 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 operational programs. 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no open or confirmatory items to resolve.

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.

AP1000 COL Information Item

- 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the relevant information presented in the VEGP 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 VEGP 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 13.5 of the AP1000 DCD, Revision 19.

In addition, in VEGP 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.

13.5.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the FSER related to the DCD.

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 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 plant procedures. 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no open or confirmatory items to resolve.

The following portion of this technical evaluation section is reproduced from Section 13.5.4 of the BLN 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 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 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 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.

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 VEGP COL FSAR related to this section. The results of the NRC staff’s technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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.

- In VEGP 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 VEGP Units 3 and 4 describes the COL applicant's physical protection program, which is intended to meet the NRC's regulations for protection against the design-basis threat (DBT) of radiological sabotage as stated in 10 CFR 73.1, "Purpose and Scope," 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 AP1000 DCD, 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 VEGP Physical Security Plan (PSP), Training and Qualification Plan (T&QP), and Safeguards Contingency Plan (SCP). VEGP Units 3 and 4 are referenced in Section 13.6 of the FSAR to describe the physical protection program and physical protection systems that are not addressed within the scope of the standard AP1000 design for meeting the NRC performance and prescriptive requirements for physical protection stated in 10 CFR Part 73, "Physical Protection of Plants and Materials." 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, which is located in the NRC's Secure Local Area Network, document number ES1000015157.

13.6.2 Summary of Application

Section 13.6 of the VEGP COL FSAR, Revision 5, incorporates by reference Section 13.6 of the AP1000 DCD, Revision 19 and Section 13.6 of the VEGP ESP SSAR, Revision 5.

Part 8 – Safeguards/Security Plans

By letter dated March 28, 2008, Southern Nuclear Operating Company (SNC) submitted a PSP to the NRC as part of the COL application for proposed VEGP Units 3 and 4. By letter dated December 11, 2009, SNC submitted a Revision 1 to the PSP. By letter dated July 30, 2010, SNC submitted Revision 2 to its PSP.

In addition, in VEGP 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.

- VEGP ESP COL 13.6-1

The applicant provided additional information in VEGP ESP COL 13.6-1 to state that specific access control measures to address the existing rail spur are addressed in Part 8 of the COL application, Physical Security Plan, Section 11.3.

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 VEGP 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 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.

- 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 and in NUREG-1923.

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 and provide a description of the implementation of the PSP. The provisions of

10 CFR 52.79(a)(36)(i) through (iv) require that the application must include an SCP in accordance with the criteria set forth in Appendix C 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.

- The provisions of 10 CFR 52.47, "Contents of applications; technical information," require that the application include an FSAR that describes the facility, presents the design bases and the limits on its operation, and presents a safety analysis of the structures, systems, and components (SSCs) and of the facility as a whole. The information provided to the Commission by the applicant must be complete and accurate and the applicant will notify the Commission of information that the applicant, licensee, or holder has identified as having a significant implication for public health and safety or common defense and security as required by 10 CFR 52.6, "Completeness and accuracy of information."

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 combined license 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 Programs 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”
- RG 5.77, “Insider Mitigation Program”
- NRC letter dated April 9, 2009, NRC Staff Review of Nuclear Energy Institute 03-12 “Template for Security Plan, Training and Qualification, Safeguards Contingency Plan, [and Independent Spent Fuel Storage Installation Security Program]” (Revision 6) (ML090920528)
- SECY-05-0197

The following documents contain 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 VEGP COL FSAR and checked the referenced DCD and the VEGP ESP SSAR to ensure that the combination of the DCD, the VEGP ESP SSAR, 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 VEGP COL application are documented in NUREG-1793 and its supplements and in NUREG-1923.

The staff reviewed the information in the VEGP COL FSAR:

AP1000 COL Information Item

- 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.

- VEGP ESP COL 13.6-1

The applicant provided additional information in VEGP ESP COL 13.6-1 to state that specific access control measures to address the existing rail spur are addressed in Part 8 of the COL application, Physical Security Plan, Section 11.3. The evaluation of VEGP ESP COL 13.6-1 is provided in Section 13.6.4.1.11 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 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 milestone included in VEGP COL FSAR Table 13.4-201 to implement the prior to receipt of fuel onsite (protected area.) The NRC staff finds the implementation milestone for the security program (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) require that a physical security plan, be provided, describing how 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," are met, 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 physical security plan.

The provisions of 10 CFR 52.79(a)(36)(i) require that a safeguards contingency plan be provided 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 contained in the applicant's safeguards contingency plan.[8] (Implementing procedures required for this plan need not be submitted for approval.) (ii) A training and qualification plan in accordance with the criteria set forth in Appendix B to 10 CFR Part 73. (iii) A cyber security plan in accordance with the criteria set forth in 10 CFR 73.54, "Protection of digital computer and communication systems and networks" of this chapter; (iv) A description of the implementation of the safeguards contingency plan, training and qualification plan, and cyber security plan; and (v) Each applicant who prepares a physical security plan, a safeguards contingency plan, a training and qualification plan, or a cyber security plan, 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 that a description of the fitness-for-duty program be provided to meet the requirements of 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 T&QP 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) and (d) and 10 CFR Part 73 by submitting a PSP, and controlling the PSP and appendices as SGI according to 10 CFR 73.21.

The provisions of 10 CFR Part 73, Appendix C, "Nuclear Power Plant Safeguards Contingency Plans," Section II.B.3(b) require 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 (PA), 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 marshalling and coordinating response activities.

In addition, Section 1.2 of the VEGP COL application describes general plant descriptions that include details of the 10 to 50 mile radius of the geographical area of the VEGP Units 3 and 4 site, a site area map, and general plant and site descriptions. VEGP COL FSAR, Chapter 1, references the AP1000 DC for the principal design and operating characteristics for the design and construction of the VEGP Units 3 and 4. Part 1, General Information, of the VEGP 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 VEGP 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 on site 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 VEGP COL FSAR is adequate.

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, 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 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, requalified, 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).

<u>Security Organization Management</u>

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, contract 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 nuclear security captain that has the authority for command and control of all security operations, is on site at all times.

The security force implementing 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 PSP meets the requirements of 10 CFR 73.55(d), and is, therefore, acceptable.

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, 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 in accordance with 10 CFR Part 73, Appendix B and the T&QP. 10 CFR Part 73, Appendix B, Section VI.G.2(a) states, 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. 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.

On the basis of its review, the NRC staff finds that Section 9 of the PSP meets the requirements of 10 CFR 73.55(d)(3) and Appendix B, Section VI.G.2., and is, therefore, acceptable.

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 licensee 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 licensee 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." 10 CFR 73.55(b) states: "Provide defense-in-depth through the integrations 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 VEGP 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 facility procedures.

In RAI 13.6-2, the NRC staff requested that the applicant provide further information with regard to the content and substance of the description of natural terrain and VBS barriers and to validate proposed stand-off distances.

On the basis of its review, the NRC staff finds the response to RAI 13.6-2 acceptable because the description provided of natural terrain features that make up portions of the outer VBS meet the requirements from 10 CFR Part 73, Appendix C, Section II.B.3.b.

In RAI 13.6-3, regarding VEGP ESP COL 13.6-1, the NRC staff asked the applicant to further describe rail traffic controls and surveillance frequencies for these controls. In its response dated October 16, 2009, the applicant provided a description of these controls and associated surveillance.

The NRC staff finds the response to RAI 13.6-3 acceptable because it provides adequate clarification on vehicle controls and surveillance, consistent with 10 CFR 73.55(e)(10)(i)(D).

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 VEGP Units 3 and 4 plant design on the intake structure for safety-related functions.

Protected Area Barriers

The provisions of 10 CFR 73.55(e)(8)(i) require that the PA 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 PSP Section 11.3. These descriptions meet the definitions of physical barrier and PA in 10 CFR 73.2, "Definitions," and the requirements of 10 CFR 73.55(e)(8).

Section 11.3 of the PSP describes the extent to which the PA 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, consistent with 10 CFR 73.55(e)(8)(i)(c).

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 PA perimeter barrier and is designed to ensure the ability to observe and assess activities on either side of the PA 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 PA is performed, must be bullet resisting.

In RAI 13.6-13, the NRC staff asked the applicant to clarify the redundancy features between the CAS and the secondary alarm station (SAS). In its response, the applicant relied on the language in Section 15.4 of its submittal, which states that both the CAS and SAS will be constructed to meet the standards provided in 10 CFR 73.55(i)(4).

On the basis of its review, the NRC staff finds the applicant's response to RAI 13.6-13 acceptable, as it provides clarification regarding SAS redundancy, which meets the requirements of 10 CFR 73.55(i)(4).

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, as required by 10 CFR 73.55(f)(3).

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 the 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, Section 7 of the meet 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 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).

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's physical protection program. The PSP describes the use of delay barriers at VEGP. Section 11.6 of the PSP includes a description of the use of delay barriers to meet the requirements 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.

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 to establish, maintain, and implement an access authorization program in accordance with 10 CFR 73.56 and to describe the program in the PSP. 10 CFR Part 26 requires that the applicant establish and maintain an 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 finds that RG 5.66, is an acceptable method for meeting the requirements of 10 CFR 73.55(b)(7).

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 establish, maintain, and implement an insider mitigation program and 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 utilizing the guidance in RG 5.77, "Insider Mitigation Program" The insider mitigation program requires elements from the access authorization program described in 10 CFR 73.56; the 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 RG 5.77, is an acceptable method for meeting the requirements 10 CFR 73.55(b)(9).

In RAI 13.6-18, the NRC staff asked the applicant to address the methodology and frequency chosen to monitor and/or patrol the spent fuel pool, including proposed alternative measures. In its response dated October 16, 2009, the applicant stated that the spent fuel pool area will be patrolled at a frequency that meets the commitments stated in PSP Section 14.2, or monitored according to site procedures.

On the basis of its review, the NRC staff finds the response to RAI 13.6-18 acceptable, as it provides a commitment from the applicant to meet 10 CFR 73.55(i)(5).

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 PA 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 PA or vital areas. When not in use, badges may be removed from the PA 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 PA. 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 the applicant 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, the applicant 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 for the applicant to search vehicles at the OCA and 10 CFR 73.55(h)(3) provides requirements for searches of personnel, vehicles and materials prior to entering the PA.

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 VEGP PA. Detailed requirements for conducting these searches are found in the applicant's implementing procedures and include the search and control of bulk materials and products. The applicant's 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 PA. 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 PA under emergency conditions.

PA Personnel Searches

Section 14.4.4 of the PSP describes the process for searches of all personnel requesting access into PAs. 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 PA. 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 the 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 all points of personnel access is through a lockable portal. The entry process is normally monitored by

multiple security personnel. Personnel are normally allowed access through means that verify identity and authorization following the search process. Vehicles are controlled through positive control methods described in 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. The applicant is 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, 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 the applicant control access into vital areas consistent with established access authorization lists. In response to a site-specific credible threat or other credible information, the applicant 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 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 reapproved no less frequently than every 31 days.

Section 14.5 of the PSP describes vital areas and that the applicant maintains vitals 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.

In RAI 13.6-19, the NRC staff asked the applicant to clarify how the minimum vital areas and equipment are protected, including any proposed revision to this section of the security plan.

The applicant responded that PSP Section 14.5 will be revised, as necessary, to clearly identify any regulatory minimum vital areas that are bounded by the larger vital areas included in the list.

On the basis of its review, the NRC staff finds the response to RAI 13.6-19 acceptable, as it provides information on how the applicant meets 10 CFR 73.55(e)(9) and 10 CFR 73.55(g)(4). The applicant's revised PSP, Revision 2, provided the information on how the applicant meets 10 CFR 73.55(e) and 10 CFR 73.55(g)(4).

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.

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. 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 on site 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 a number of armed response force personnel immediately available at all times to implement the 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 also 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.

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. 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 *Appendix B Training and Qualification Plan*

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 are, therefore, acceptable.

On-the-job Training

The provisions of 10 CFR Part 73, Appendix B, Sections VI.C.2(a) through (c) provide 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) redeployment; (8) communications (primary and alternate); (9) use of assigned equipment; (10) target sets; (11) table top drills; (12) command and control duties; (13) applicant 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, applicant 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 requirements for demonstration of qualification.

Section 3.4 of the T&QP describes that the individuals must be trained and qualified prior to performing security-related duties within the 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 describes 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 VI.D.1, and are, 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 requalified 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 to by a security supervisor.

Section 3.5 of the T&QP provides a 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 months before or three 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, similar to what is 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 require 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 years. Applicants shall conduct annual firearms familiarization and armed members of the security organization must participate in weapons range activities on a nominal four 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 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 requalified with assigned weapons. All weapons qualification and requalification 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's 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) 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, 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 requalified 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 requalify, 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 VI.G, and is, therefore, acceptable.

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 years after termination of the individual's employment and shall retain each requalification record for three 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 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.

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."

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 *Appendix C Safeguards Contingency Plan*

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.

Purpose of the Safeguards Contingency Plan

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.1 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's planning base include factors affecting the SCP are 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 contingency events, and 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.

In RAI 13.6-28, the NRC staff requested that the applicant improve the level of detail identified in this section to be consistent with the referenced Section 1.1 and Figures 6, 7, 8, and 9. The NRC staff requests that the plan and maps be updated to reflect the necessary information. In its response dated March 5, 2010, the applicant stated that the required regulatory basis information will be incorporated into Section 1.1 of a future revision to the PSP. The PSP Revision 2, Section 1.1 included the required information.

On the basis of its review, the NRC staff finds the response to RAI 13.6-28 acceptable, The applicant submitted the revised PSP Section 1.1, and provided the additional information on site layout to meet the requirements consistent with 10 CFR Part 73, Appendix C, Section II.B.3.b.

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 the 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, a general description of their response capabilities, 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 the applicant's response to incidents. These must include, but are 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 practices, which influence how the security organization responds to a safeguards contingency event to include, but not limited to, a description of the procedures that will be used for ensuring that equipment needed to facilitate responses 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, Nuclear Security Captain, 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 are, 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), (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, 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 of 10 CFR Part 50 and 10 CFR 52.17.

Response to Threats

Section 5.1 of the SCP describes that 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 use 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 Independent Spent Fuel Storage Installation (ISFSI) Events

VEGP does 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 meet the requirements of 10 CFR 50.54(p)(1), (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 are, 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.

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.

In RAI 13.6-31, the NRC staff asked for clarification regarding how the 1994 VBS is incorporated into the defense of the PA around VEGP Units 3 and 4. In its response, the applicant stated that VEGP Units 3 and 4 will have a single VBS that is designed to meet the current requirements of 10 CFR 73.55 and will provide sufficient protection of the plant and associated assets from the DBT vehicle bomb. On May 28, 2010, the applicant supplemented its response to provide additional clarity regarding construction methodology.

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.

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 proposes to include the following license condition for physical security:

- 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 and the VEGP ESP SSAR. 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements and in NUREG-1923.

The staff concludes that the relevant information presented in the VEGP 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 PSP, T&QP and SCP, has focused on ensuring the necessary programmatic elements are included in these plans in order 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/licensee. 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 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). 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 that the overall protective strategy can be effectively implemented. As such, the NRC staff's 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.

VEGP ESP COL 13.6-1 as related to the specific access control measures to address the existing rail spur is acceptable because it provides adequate clarification on vehicle controls and surveillance, consistent with 10 CFR 73.55(e)(10)(i)(D).

13.6.A Site-Specific ITAAC for Physical Security

13.6.A.1 *Introduction*

In Part 10, "Proposed License Conditions (Including ITAAC)," Appendix B, "Inspection, Test, Analysis, and Acceptance Criteria" of the VEGP Units 3 and 4 COL application, the applicant 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 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.

The design bases or supporting security analyses and assumptions related to the design descriptions of security-related features incorporated as reference from the AP1000 DCD is TR 94, APP-GW-GLR-066. Descriptions of site-specific security structures, programs and contingency measures are located in the VEGP PSP, which includes the site physical security plan, T&QP, and the SCP.

13.6.A.2 *Summary of Application*

Section 14.3 of the VEGP COL FSAR, Revision 5, incorporates by reference Section 14.3 of the AP1000 DCD, Revision 19. Part 10, of the VEGP 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 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.

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

Supplemental Information

- STD SUP 14.3-1

The applicant provided SUP information related to physical security in STD SUP 14.3-1 in VEGP 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 VEGP 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 the FSER related to the DCD.

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 VEGP Units 3 and 4 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 that are based on physical protection systems or hardware provided for meeting requirements of the following Commission regulations:

- 10 CFR Part 50
- 10 CFR Part 52
- 10 CFR 73.1(a)(1), "Radiological Sabotage"
- 10 CFR 73.55, Appendix B, "General Criteria for Security Personnel"; Appendix C, "Nuclear Power Plant Safeguards Contingency Plans"; Appendix G, "Reportable Safeguards Events"; and Appendix H, "Weapons Qualification Criteria"
- 10 CFR Part 74, "Material control and accounting of special nuclear material"
- 10 CFR 100.21(f)
- 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
- RG 4.7, "General Site Suitability Criteria for Nuclear Power Stations," Revision 2
- RG 5.7
- RG 5.12
- RG 5.29, "Material Control and Accounting for Nuclear Power Reactors"
- RG 5.44
- RG 5.62
- RG 5.65
- RG 5.66

- Information Notice 86-83, “Underground Pathways into Protected Areas, Vital Areas, and Controlled Access Areas,” September 19, 1986

- 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 demonstrate, if adequately implemented, provides 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 specific and 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. Within this context, the DC applicant is required only to address those elements or portion of physical protection system or features that are considered within the scope of design. The technical basis for physical protection hardware within the scope of the design provides the basis for ITAAC verification and closure.

13.6.A.4 *Technical Evaluation*

The NRC staff reviewed Section 14.3 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 ITAAC for physical security. 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.

The staff reviewed the information in the VEGP COL FSAR:

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 VEGP COL FSAR

related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the relevant information presented in the VEGP 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 VEGP 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 VEGP COL.

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 allow 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.
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.

Table 13.6A 1. Site-Specific Physical Security Inspections, Tests, Analyses and Acceptance Criteria

Design Commitment	Inspections, Tests, and Analyses	Acceptance Criteria
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.
8.a) Penetrations 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 penetrations through the protected area barrier. Inspections will be performed of unattended openings that intersect the protected area boundary or vital area boundary.	Penetrations and openings through the protected area barrier are secured and monitored. 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.

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, 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

Section 13.7 of the VEGP COL FSAR, Revision 5, incorporates by reference Section 13.7 of the VEGP ESP SSAR, Revision 5. VEGP COL FSAR Section 13.7 is a new section added after Section 13.6 of the AP1000 DCD, Revision 19. The references that are currently in DCD Section 13.7 have been redistributed to other VEGP FSAR sections. There is no information associated with the FFD program incorporated by reference from the AP1000 DCD.

In addition, in VEGP COL FSAR Section 13.7, the applicant provided the following:

Supplemental Information

- STD SUP 13.7-1

The applicant provided STD SUP information in VEGP 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 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 VEGP COL FSAR Table 13.4-201 including the Fitness for Duty Program.

13.7.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in NUREG-1923.

In addition, the applicable regulatory requirements for STD SUP 13.7-1 are as follows:

- 10 CFR Part 26
- 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 VEGP COL FSAR and checked the referenced VEGP ESP SSAR to ensure that the combination of the VEGP ESP SSAR 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 FFD program. The results of the NRC staff's evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1923.

The staff reviewed the information in the VEGP COL FSAR:

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	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

Item	Program Title	Program Source (required by)	FSAR Section	Implementation Milestone	Implementation Requirements
	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.

13.7.5 Post Combined License Activities

For the reasons discussed in the technical evaluation section above, the staff proposes to include the following license conditions to address the FFD program details:

- 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 VEGP COL FSAR related to this section.

The staff concludes that the information presented in the VEGP 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 14, 2010, the SNC submitted Revision 0 of the Cyber Security Plan (CSP) for VEGP Units 3 and 4. The CSP applies to all critical digital assets required for VEGP 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 DBT described in 10 CFR 73.1. 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 VEGP COL FSAR. Section 13.6 of the VEGP COL FSAR, Revision 5, incorporates by reference Section 13.6 of the AP1000 DCD, Revision 19, and Section 13.6 of the VEGP ESP)Application SSAR, Revision 5. 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 VEGP 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 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 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 VEGP COL application to provide a schedule to support the NRC's inspection of operational programs included in the VEGP 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 and in NUREG-1923.

The applicable regulatory requirements for cyber security are as follows:

- 10 CFR 73.1
- 10 CFR 73.54

- 10 CFR 73.55, paragraphs (a)(1), (b)(8), and (m)
- 10 CFR 73.58, "Safety/Security Interface Requirements for Nuclear Power Reactors"
- 10 CFR Part 73, Appendix G, "Reportable Safeguards Events"

The applicable regulatory guidance for cyber security is included in RG 5.71.

13.8.4 Technical Evaluation

The NRC staff reviewed Section 13.6 of the VEGP COL FSAR and checked the referenced DCD and the VEGP ESP SSAR to ensure that the combination of the DCD, the VEGP ESP SSAR, 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 VEGP COL application are documented in NUREG-1793 and its supplements and in NUREG-1923.

The staff's review of the VEGP 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 VEGP 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.

The staff reviewed the information in the VEGP COL FSAR:

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 *Security Assessment and Authorization (Section A.3.1.1 of Appendix A to RG 5.71)*

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 *Incorporating the Cyber Security Program into the Physical Protection Program (Section A.3.2 of Appendix A to RG 5.71)*

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. 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 including 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.

13.8.5 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 (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 and the VEGP ESP SSAR. 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements and in NUREG-1923.

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.

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 U.S. 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 Vogtle Electric Generating Plant (VEGP) 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.[22] 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 VEGP COL application are documented in NUREG-1793, "Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design," and its supplements.

[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 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 VEGP 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 VEGP 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 the FSER related to the DCD.

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."

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 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 initial test program summary and objectives. 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 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 with open items issued for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs) and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was a confirmatory item (Confirmatory Item 14.2-1) related to the standard content in the BLN SER. The resolution of this item is addressed in this 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VEGP 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 VEGP 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.

VEGP 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 VEGP 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 the FSER related to the DCD.

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 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 initial test program organization, staffing, and responsibilities. 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was a confirmatory item (Confirmatory Item 14.2-2) related to the standard content in the BLN SER. The resolution of this item is addressed in this SER.

The following portion of this technical evaluation section is reproduced from Section 14.2.2.4 of the BLN 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VEGP 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 VEGP 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 VEGP 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 VEGP 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 October 15, 2010, the applicant 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 October 15, 2010, the applicant proposed a revision to Item c of License Condition 6.

- Part 10, License Condition 8

The proposed license condition will require the licensee to report any changes to the initial test program (ITP) 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 the FSER related to the DCD.

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 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 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 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were confirmatory items (Confirmatory Items 14.2-3 through 14.2-6) and open items (Open Items 14.2-1 and 14.2-2) related to the standard content in the BLN SER. The resolutions are addressed in this SER.

The following portion of this technical evaluation section is reproduced from Section 14.2.3.4 of the BLN 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.

<u>Test Records</u>

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 proposes to include the following license conditions:

- 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 VEGP 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VEGP 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 the administrative controls for the review, evaluation, and approval of test results by qualified personnel, and 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 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 October 15, 2010, the applicant proposed a revision to License Condition Item 14.4-6.

- Part 10, License Condition 7

In its letter dated June 18, 2010, the applicant proposed License Condition 7, providing additional details on first-plant-only and three-plant-only tests. In a letter dated October 15, 2010, the applicant 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 the FSER related to the DCD.

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 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 utilization of operating and testing experience. 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was a confirmatory item (Confirmatory Item 14.2-7) related to the standard content in the BLN SER. The resolution of this item is addressed in this 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 VEGP COL FSAR related to this section. The results of the NRC staff’s technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VEGP 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 VEGP 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 VEGP 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 the FSER related to the DCD.

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 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 plant operating and emergency procedures. 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was a confirmatory item (Confirmatory Item 14.2-8) related to the standard content in the BLN SER. The resolution of this item is addressed in this 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 VEGP COL FSAR related to this section. The results of the NRC staff's

technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 June 18, 2010, the applicant proposed License Condition 9, providing additional detail on the power-ascension test phase. In a letter dated October 15, 2010, the applicant 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 the FSER related to the DCD.

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 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 test program schedule. 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was a confirmatory item (Confirmatory Item 14.2-9) related to the standard content in the BLN SER. The resolution of this item is addressed in this 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[23], 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.

[23] The first letter dated June 18, 2010, provided proposed License Condition 7, which is evaluated in Section 14.2.5 of this SER.

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 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 ITP (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 (ITP). 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) -

  Pre-operational Testing

  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.

  Pre-critical and Criticality Testing

  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 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VEGP 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 VEGP 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 VEGP 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 the FSER related to the DCD.

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 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 preoperational test descriptions. 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were two confirmatory items (Confirmatory Items 14.2-10 and 14.2-11) related to the standard content in the BLN SER. The resolution of these items is addressed in this 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of

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

In addition, the staff concludes that the information presented in the VEGP 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 VEGP 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 VEGP 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 the FSER related to the DCD.

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 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 startup test procedures. 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was one

confirmatory item (Confirmatory Item 14.2-12) related to the standard content in the BLN SER. The resolution of this item is addressed in 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.

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VEGP 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 VEGP 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 14.3 of the AP1000 DCD, Revision 19. The advanced safety evaluation (ASE) with confirmatory items for Section 14.3.2 was based on the VEGP 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 VEGP 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.

- STD COL 3.9-7

In a letter dated April 23, 2010, the applicant 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 VEGP COL FSAR Section 14.3.2.3, "Site-Specific ITAAC (SS-ITAAC)." This section describes the SS-ITAAC.

- VEGP SUP 14.3-1

The applicant provided supplemental information in VEGP SUP 14.3-1 in VEGP COL FSAR Section 14.3.2.3.1, "Emergency Planning ITAAC (EP-ITAAC)," discussing the EP-ITAAC developed in the Early Site Permit (ESP) application.

- VEGP SUP 14.3-2

The applicant provided supplemental information in VEGP SUP 14.3-2 in VEGP COL FSAR Section 14.3.2.3.3, "Other Site–Specific Systems," discussing the ITAAC screening summary for site-specific systems.

- VEGP SUP 14.3-3

The applicant provided supplemental information in VEGP SUP 14.3-3 in VEGP COL FSAR Section 14.3.3.1, "Non-System Based Site Specific ITAAC," discussing the Nuclear Island engineered backfill and waterproof membrane.

14.3.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the FSER related to the DCD.

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 VEGP SUP 14.3-3 is addressed in Sections 2.5.4 and 3.8.5 of NUREG-1923, "Safety Evaluation Report for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant (VEGP) ESP Site."

The regulatory basis for VEGP STD 3.6-1 and 3.9-7 are provided in NUREG-0800.

14.3.4 Technical Evaluation

The NRC staff reviewed Section 14.3 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 CDMs. 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was a confirmatory item (Confirmatory Item 14.3-1) related to the standard content in the BLN SER. The resolution of this item is addressed in this 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

- VEGP 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 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.

> *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.

- VEGP SUP 14.3-1

VEGP SUP 14.3-1 is evaluated by the NRC staff in Section 13.3 of this SER.

- VEGP SUP 14.3-3

The applicant provided supplemental information in VEGP SUP 14.3-3 in VEGP COL FSAR Section 14.3.3.1, "Non-System Based Site Specific ITAAC," discussing the Nuclear Island engineered backfill and waterproof membrane. The staff's review of the SS ITAAC for the Nuclear Island engineered backfill and waterproof membrane are documented in Sections 2.5.4.3.5 and 3.8.5, respectively, of NUREG-1923.

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the information presented in the VEGP 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 VEGP 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 Vogtle Electric Generating Plant (VEGP) COL FSAR Chapter 15 follows the format in VEGP 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 15.0 of the AP1000 Design Control Document (DCD), Revision 19. The advanced safety evaluation (ASE) with confirmatory items for Section 15.0.2 was based on the VEGP COL FSAR, Revision 2 and DCD Revision 17. After submitting DCD Revision 17 to the NRC, Westinghouse added a new COL information Item (COL 15.0-1). This COL information item has been incorporated into Revision 18 of the DCD.

In a letter dated February 8, 2011, the applicant revised its previous response (dated October 29, 2010) to address the Advisory Committee on Reactor Safeguards recommendation on the requirement of in-plant testing of the feedwater flow measurement instrumentation. The discussion of the COL information item below reflects that revised response.

AP1000 COL Information Item

- STD COL 15.0-1

In a letter dated May 21, 2010, as supplemented by a letter dated October 29, 2010, the applicant proposed Standard (STD) COL 15.0-1, adding new text to VEGP 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 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 Leading Edge Flow Meter (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 inspections, tests, analyses and acceptance criteria (ITAAC) item in lieu of License Condition 2.

- 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.

Inspections, Tests, Analyses and Acceptance Criteria

In a letter dated October 29, 2010, the applicant 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." 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 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.[24] 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 VEGP COL application are documented in NUREG-1793 and its supplements.

The staff reviewed the information in the VEGP COL FSAR:

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™ 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.

[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 DC.

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.

License Conditions

- 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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 VEGP Units 3 and 4. 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 15.4 of the AP1000 DCD, Revision 19.

In addition, in Section 1.9 of the VEGP COL FSAR, the applicant provided the following:

Generic Letter 85-05

The applicant proposed in a letter dated January 22, 2010, to include Generic Letter (GL) 85-05, "Inadvertent Boron Dilution Events," in Table 1.9-204 of the VEGP COL 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 the FSER related to the DCD.

15.4.4 Technical Evaluation

The NRC staff reviewed Section 15.4 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 reactivity and power distribution anomalies. 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 with open items issued for the Bellefonte Nuclear Plant (BLN) Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1, to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was one open item (Open Item 15.4-1) to resolve. The resolution of the item is addressed in this SER.

The following portion of this technical evaluation section is reproduced from Section 15.4.4 of the BLN 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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 increase reactor coolant inventory

Section 15.5 of the VEGP 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 VEGP 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 VEGP COL FSAR has one item, VEGP COL 2.3-4, related to site-specific χ/Q values. The effect of VEGP 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 VEGP 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 VEGP 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 15.7 of the AP1000 DCD, Revision 19.

In addition, in VEGP COL FSAR Section 15.7, the applicant provided the following:

AP1000 COL Information Item

- VEGP COL 15.7-1

The applicant provided additional information in VEGP 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 VEGP Early Site Permit (ESP) Application Site Safety Analysis Report (SSAR) Section 2.4.13.

15.7.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the FSER related to the DCD.

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”

- 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 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 radioactive release from a subsystem or component. 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.

The staff reviewed the information in the VEGP COL FSAR:

AP1000 COL Information Item

- VEGP 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 VEGP ESP SSAR 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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:

- VEGP 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 VEGP 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 VEGP 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 VEGP 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

- VEGP COL 2.3-4

In VEGP COL FSAR Sections 15.6 and 15A, the applicant provided additional information in VEGP 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 VEGP 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.

Variances

- VEGP ESP VAR 1.6-3

This variance (VAR) states that VEGP ESP SSAR Chapter 15 is not incorporated by reference into the VEGP COL FSAR.

15A.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the FSER related to the DCD.

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 VEGP 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 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 radiological consequences of accidents. 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.

The staff reviewed the information in the VEGP COL FSAR:

AP1000 COL Information Item

- VEGP COL 2.3-4

In VEGP COL FSAR Sections 15.6 and 15A, the applicant stated that it provided additional information in VEGP 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).

VEGP 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 VEGP 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 VEGP 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 VEGP COL 2.3-4, the applicant discussed the VEGP site-specific short-term (accident) χ/Q values in VEGP COL FSAR Section 2.3.4. The VEGP site-specific EAB and LPZ χ/Q values for DBAs are given in VEGP COL FSAR Table 2.0-201, and the control room χ/Q values for DBAs are given in VEGP COL FSAR Table 2.0-202. In Section 2.3.4 of this SER, the NRC staff discusses its review of the VEGP site-specific χ/Q values and resolution to VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP DEP 18.8-1.

Variances

- VEGP ESP VAR 1.6-3

Chapter 15 of the VEGP ESP SSAR contains accident release information based upon Revision 15 of the AP1000 DCD. This information has been superseded by the associated section of a later revision of the AP1000 DCD, which is incorporated by reference into the VEGP COLA FSAR. The later revision of the AP1000 DCD contains the most updated information. The staff's review of the VEGP COL FSAR Chapter 15 is included in this SER. Therefore, this variance is acceptable.

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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:

- VEGP COL 2.3-4 and VEGP ESP VAR 1.6-3 are 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 VEGP 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 VEGP 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 non-safety systems (RTNSS).

16.1 Technical Specifications

16.1.1 Introduction

Section 16.1, "Technical Specifications," of the Vogtle Electric Generating Plant (VEGP) combined license (COL) Final Safety Analysis Report (FSAR), and the VEGP COL Part 4, "Technical Specifications," provide the PTS for VEGP Units 3 and 4 in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.36, "Technical specifications," 10 CFR 52.47(a)(11), 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 VEGP 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 VEGP 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 VEGP 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 VEGP COL Part 4, the applicant provided the following:

AP1000 COL Information Item

- VEGP COL 16.1-1

The applicant provided additional information in VEGP 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 VEGP 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." Areas of review that interface with other sections of the 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 52.47(a)(11)
- 10 CFR 52.79(a)(30)

16.1.4 Technical Evaluation

The NRC staff reviewed Section 16.1 of the VEGP COL FSAR and Part 4 of the VEGP 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[25]. The NRC staff's review confirmed that the information in the application and incorporated by

[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).

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 VEGP 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 with open items issued for the Bellefonte Nuclear Plant (BLN) Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs) and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was one open item (Open Item 16.1-1) to resolve related to the standard content in the BLN SER. Its resolution is addressed in this SER.

Many VEGP SER section numbers in this evaluation were changed from those used in the BLN SER to more closely follow the PTS numbering. The corresponding BLN SER section numbers are identified prior to quoting standard content material.

The staff reviewed the information in the VEGP COL FSAR and the VEGP COL application, Part 4:

AP1000 COL Information Item

- VEGP COL 16.1-1

The following portion of this technical evaluation section is reproduced from Section 16.1.4 of the BLN SER:

- *BLN COL 16.1-1*

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 VEGP 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 VEGP PTS is identical to the AP1000 GTS except for site-specific information provided by the applicant. In Section 4.1, the applicant provided the VEGP 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 VEGP Early Site Permit (ESP) Application Site Safety Analysis Report (SSAR), Revision 5, Section 2.1.1.1, and in accordance with the guidance provided in the GTS. In Section 4.1.1, the applicant provided the site location description, which describes its site boundary, and its exclusion area boundary. The staff found the added information acceptable since it is consistent with related information found in VEGP ESP SSAR Section 2.1.1.1, and in accordance with the guidance provided in the GTS. In Section 4.1.2, the applicant also provided the site location description, which establishes its low population zone. The staff found the added information acceptable since it is consistent with related information found in VEGP ESP SSAR Section 2.1.3.4, and is in accordance with the guidance provided in the GTS.

16.1.4.5 *Administrative Controls*

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* [VEGP 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 VEGP PTS and Bases, and there is no outstanding information expected to be addressed in the VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP 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 VEGP COL FSAR and Part 4 of the VEGP 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 VEGP 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 VEGP 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 16.3 of the AP1000 DCD, Revision 19.

In addition, in VEGP 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 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 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no confirmatory or open items to resolve.

The following portion of this technical evaluation section is reproduced from Section 16.3.4 of the BLN 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).

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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 Vogtle Electric Generating Plant (VEGP) 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 VEGP COL FSAR Section 17.1, the applicant provided the following:

AP1000 COL Information Item

- VEGP COL 17.5-1

The applicant provided additional information in VEGP COL 17.5-1 to address COL Information Item 17.5-1. In VEGP COL 17.5-1, the applicant states that the quality assurance program description (QAPD) discussed in Section 17.5 of the VEGP COL FSAR addresses the QA program under which the COL application was developed and establishes the requirements for the remaining portion of the design and construction phases.

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 VEGP 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 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.[26] 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 VEGP 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 with open items issued for the Bellefonte Nuclear Plant (BLN) Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs) and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was one open item (Open Item 17.1-1) to resolve related to the standard content in the BLN SER. Its resolution is addressed in this SER.

The staff reviewed the information in the VEGP COL FSAR:

AP1000 COL Information Item

- VEGP COL 17.5-1

The NRC staff reviewed the partial resolution of VEGP COL 17.5-1 related to QA during the design and construction phases until COL issuance included under Section 17.1 of the VEGP COL FSAR. The remaining information for VEGP COL 17.5-1 is included in Section 17.5 of the VEGP COL FSAR. The staff's review of VEGP 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 application development through operations. The applicant included additional text in VEGP COL FSAR Section 17.1 to address Southern Nuclear Operating Company's (SNC's) responsibility for establishing and executing the QA program requirements during the design

[26] 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.

and construction phases of VEGP Units 3 and 4. VEGP COL FSAR Section 17.1 further states that SNC maintains oversight of its contractors under the QAPD discussed in Section 17.5 of the VEGP COL FSAR.

In RAI 17.5-1, dated November 25, 2008, the NRC staff requested clarification on the expected SNC, Bechtel Corporation, and MacTec Corporation scope of work related to the applicant's COL application design activities from the time of docketing until the time the COL might be issued. In its letter, dated December 17, 2008, the applicant stated that design, procurement, and construction activities associated with VEGP Units 3 and 4 are being and will continue to be conducted in accordance with the QAPD discussed in Section 17.5 of the VEGP COL FSAR. The NRC staff has reviewed the applicant's response and finds that it is adequate; therefore, RAI 17.5-1 is closed.

The NRC staff also reviewed Appendix 1AA of the VEGP COL FSAR, which lists VEGP's conformance with NRC regulatory guides (RGs) and provides any exceptions to conformance with those RGs.

The following portion of this technical evaluation section is reproduced from Section 17.1.4 of the BLN 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 March 2009, the NRC conducted an inspection at the SNC facility in Birmingham, Alabama, as documented in inspection report numbers 05200025/2009-201 and 05200026/2009-201 dated April 16, 2009. The purpose of the NRC inspection was to verify that QA processes and procedures were effectively implemented with regard to the VEGP COL application. In this inspection, the NRC inspectors identified two violations of NRC requirements related to document control and corrective actions. SNC responded to the Notice of Violation (NOV) by letter dated May 15, 2009. SNC identified its actions to correct and prevent recurrence of the violations and committed to provide a date when final compliance was achieved. Based on the NOV and SNC 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

Based on the information provided by the applicant, the staff concludes that VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 17.4 of the AP1000 DCD, Revision 19.

In addition, in VEGP 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 non-safety-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 the FSER related to the DCD.

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, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants." The staff requirements memorandum (SRM) on SECY-95-132, "Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems in Passive Plant Designs," states that 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.

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 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 D-RAP. 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There was a confirmatory item (Confirmatory Item 17.4-1) related to the standard content in the BLN SER. Its resolution is addressed in this 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 non-safety-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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the relevant information presented in Section 17.4 of the VEGP 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 VEGP 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 application development with full implementation of the operations-related requirements consistent with VEGP COL FSAR Table 13.4-201, "Operational Programs Required by NRC Regulations."

17.5.2 Summary of Application

In Part 11 of the VEGP COL application, the applicant provided a QAPD to be in place during the design, construction, and operations phases. This QAPD is incorporated by reference in VEGP COL FSAR Section 17.5.

In addition, in VEGP COL FSAR Section 17.5, the applicant provided the following:

AP1000 COL Information Items

- VEGP COL 17.5-1

The applicant provided additional information in VEGP COL 17.5-1 to address COL Information Item 17.5-1. VEGP 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:

10 CFR Part 50, Appendix B, 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.

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).

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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were six open items to resolve (Open Items 17.5-1 through 17.5-6) related to the standard content in the BLN SER. Their resolutions are addressed in this SER.

Although the staff concluded that the evaluation performed for the standard content is directly applicable to the VEGP COL application, there were differences between the information provided by the VEGP applicant and that provided by the BLN applicant regarding details in the FSAR and the QAPD. The resolutions of these differences for VEGP 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 BLN 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 RAI 17.5-2, dated November 25, 2008, the NRC staff requested that the applicant describe its plans for revising the submitted QAPD to incorporate changes to NEI 06-14A, Revision 5, which was under review by the staff. In its response dated December 31, 2009, the applicant proposed to revise Section 17.5 of the VEGP COL FSAR to state that the QAPD is based on NEI 06-14A and delete the statement that NEI 06-14A is currently under review by the NRC

staff. Additionally, the applicant proposed to revise Section 17.8 of the VEGP COL FSAR to reference Revision 7 of NEI 06-14A, which was approved by the NRC staff in a letter dated November 3, 2009. These items are identified as **Confirmatory Item 17.5-2**, pending formal revision of the VEGP COL FSAR.

Resolution of VEGP Site-specific Confirmatory Item 17.5-2

Confirmatory Item 17.5-2 is an applicant commitment to revise its FSAR Sections 17.5 and 17.8. The staff verified that the VEGP COL FSAR was appropriately updated. As a result, Confirmatory Item 17.5-2 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 VEGP COL 17.5-1, which are addressed in the VEGP QAPD. The VEGP QAPD is based on NEI 06-14A, 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 VEGP COL 17.5-1

The following portion of this technical evaluation section is reproduced from Section 17.5.4 of the BLN 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 the SNC QAPD, the NRC staff identified an issue in the introduction of SNC's QAPD that required further clarification. In RAI 17.5-4, dated November 25, 2008, the NRC staff requested that the applicant explain the applicability of the statement in Part I, Section 1.1, which states that the QA manual also applies to activities until turnover to Operations. In its response dated December 17, 2008, the applicant stated that the statement is representative of the fact that the current QA program for the SNC Fleet Operations organization is not the QAPD submitted as part of the VEGP COL FSAR, but rather an NRC-approved Quality Assurance Topical Report (QATR). To alleviate any confusion, the applicant proposed to delete the statement.

Based on Revision 8.1 to VEGP QAPD Part I, Section 1.1, provided in Part 11 of the VEGP COL application, the NRC staff determined that the proposed revision is acceptable because the confusion was resolved. The NRC staff has verified that the proposed revision was incorporated into Revision 9 of the VEGP QAPD. This is **Confirmatory Item 17.5-3** subject to formal revision of the QAPD.

Resolution of VEGP Site-specific Confirmatory Item 17.5-3

Confirmatory Item 17.5-3 is an applicant commitment to revise its QAPD. The staff verified that the VEGP COL application was appropriately updated. As a result, Confirmatory Item 17.5-3 is now closed.

Further NRC staff evaluation of the COL review items and the SNC 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 BLN 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 November 25, 2008, the NRC staff requested that the applicant provide a description of the QA organizations for construction, and operation, and the transition between these phases. In addition, the applicant should describe plans for revising the QAPD to incorporate changes consistent with the NRC requested changes to NEI 06-14A, Revision 5. 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 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 the QA organizations for construction and operations, including the transition between these phases, have been adequately addressed. The NRC staff has also verified that SNC has proposed changes to the SNC QAPD, which incorporate all of the revisions in NEI 06-14A, Revision 7, as approved by the NRC staff. These items are identified as **Confirmatory Item 17.5-4**, pending NRC review of the revised QAPD as referenced in Section 17.5 of the VEGP COL FSAR.

Resolution of VEGP Site-specific Confirmatory Item 17.5-4

Confirmatory Item 17.5-4 is an applicant commitment to revise its QAPD. The staff verified that the VEGP COL application was appropriately updated. As a result, Confirmatory Item 17.5-4 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 BLN 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.*

In RAI 17.5-6, dated November 25, 2008, the NRC staff requested that the VEGP applicant revise the language in Part II, Section 2 of the QAPD to include a description of the QA program applied to the design, and to be applied to the fabrication, construction, and testing of the SSCs of the facility and to the managerial and administrative controls to be used to assure safe operation. The NRC staff also requested that the applicant identify the corresponding FSAR section(s) that describe safety-related SSCs or clarify the purpose of this statement in the QAPD. 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 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 the revised language in Part II, Section 2, of the SNC QAPD adequately addressed the requirements of Appendix B to 10 CFR Part 50. The NRC staff has also verified that the SNC QAPD, Revision 9, markup has deleted the statement that safety-related SSCs are described in the FSAR. These items are identified as **Confirmatory Item 17.5-5**, pending NRC review of the revised QAPD as referenced in Section 17.5 of the VEGP COL FSAR.

Resolution of VEGP Site-specific Confirmatory Item 17.5-5

Confirmatory Item 17.5-5 is an applicant commitment to revise its QAPD. The staff verified that the VEGP COL application was appropriately updated. As a result, Confirmatory Item 17.5-5 is now closed.

In RAI 17.5-3, dated November 25, 2008, the NRC staff requested that the applicant identify the site-specific design basis activities in Part II, Section 2.3 of the QAPD, consistent with the guidance of NEI 06-14A or justify its omission. 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 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 2.3 consistent with NEI 06-14A, Revision 7. These items are identified as **Confirmatory Item 17.5-6**, pending NRC review of the revised QAPD as referenced in Section 17.5 of the VEGP COL FSAR.

Resolution of VEGP Site-specific Confirmatory Item 17.5-6

Confirmatory Item 17.5-6 is an applicant commitment to revise its QAPD. The staff verified that the VEGP COL application was appropriately updated. As a result, Confirmatory Item 17.5-6 is now closed.

The following portion of this technical evaluation section is reproduced from Section 17.5.4.2 of the BLN 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.

Resolution of Standard Content Confirmatory Item 17.5-7

Confirmatory Item 17.5-7 is an applicant commitment to revise its QAPD. The staff verified that the VEGP COL application was appropriately updated. As a result, Confirmatory Item 17.5-7 is now closed.

The following portion of this technical evaluation section is reproduced from Section 17.5.4.2 of the BLN 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.

17.5.4.3 *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.*

17.5.4.4 *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.

17.5.4.5 *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.

17.5.4.6 *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.

17.5.4.7 *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.

17.5.4.8 *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.*

17.5.4.9 *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.*

17.5.4.10 *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.

17.5.4.11 *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.*

17.5.4.12 *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.*

17.5.4.13 *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 a letter dated December 31, 2009, the VEGP applicant proposed a revision to the SNC QAPD to clarify that only the precautions in Section 3 are committed to in accordance with RG 1.37, "Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components of Water-Cooled Nuclear Power Plants," Revision 1. The NRC staff has determined that this clarification is acceptable because commitment to Subpart 3.2,

Appendix 2.1, Section 3 is consistent with Regulatory Position 3 of RG 1.37. These items are identified as **Confirmatory Item 17.5-13**, pending NRC review of the revised QAPD as referenced in Section 17.5 of the VEGP COL FSAR.

Resolution of Standard Content Confirmatory Item 17.5-13

Confirmatory Item 17.5-13 is an applicant commitment to revise its QAPD. The staff verified that the VEGP COL application was appropriately updated. As a result, Confirmatory Item 17.5-13 is now closed.

17.5.4.14 *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.*

17.5.4.15 *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.*

17.5.4.16 *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.*

17.5.4.17 *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.

17.5.4.18 *Quality Assurance Audits*

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.

17.5.4.19 *Non-Safety-Related SSCs Quality Assurance Control*

17.5.4.19.1 Non-Safety-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 VEGP Site-specific 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 Non-Safety-Related SSCs Credited for Regulatory Events

SNC's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.V.2, to establish the quality requirements for non-safety-related SSCs credited for regulatory events. In the QAPD, SNC commits to comply with the following regulatory guidance:

- SNC 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.

- SNC shall implement quality provisions for anticipated transient without scram (ATWS) equipment in accordance with Part III, Section 1 of the QAPD.

- SNC shall implement quality provisions for station blackout (SBO) equipment in accordance with Part III, Section 1 of the QAPD.

17.5.4.20 *Regulatory Commitments*

SNC's QAPD follows the guidance of Section 17.5 of NUREG-0800, paragraph II.U. The QAPD establishes QA program commitments. In the QAPD, SNC 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 1.29, "Seismic Design Classification," Revision 4.

- RG 1.33, "Quality Assurance Program Requirements (Operations)," Revision 2.

- ASME NQA-1-1994, "Quality Assurance Requirements for Nuclear Facility Applications," Parts I and II.

- Nuclear Information and Records Management Association (NIRMA) technical guides, as described in Part II, Section 17 of the QAPD.

In RAI 17.5-8, dated November 25, 2008, the NRC staff requested that the applicant describe how the SNC QAPD satisfies the regulatory positions established in RG 1.28, Section C. In its response, dated December 17, 2008, the applicant stated that a previous version of the SNC QAPD included a reference to RG 1.28, which was later removed after a review of conformance with NEI 06-14A was performed. In a letter dated December 31, 2009, the applicant provided a markup of Revision 9 of the SNC QAPD. The NRC staff has verified that the SNC QAPD, Revision 9, markup has included a commitment to RG 1.28, Revision 3, issued August 1985, in Part IV of the SNC QAPD. These items are identified as **Confirmatory Item 17.5-15**, pending NRC review of the revised QAPD as referenced in Section 17.5 of the VEGP COL FSAR.

Resolution of VEGP Site-specific Confirmatory Item 17.5-15

Confirmatory Item 17.5-15 is an applicant commitment to revise its QAPD. The staff verified that the VEGP COL application was appropriately updated. As a result, Confirmatory Item 17.5-15 is now closed.

The following portion of this technical evaluation section is reproduced from Section 17.5.4.20 of the BLN 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 BLN 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.

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 SNC's QAPD and concludes that:

- The QAPD provides adequate guidance for SNC to describe the authority and responsibility of management and supervisory personnel, performance/verification personnel, and self-assessment personnel.

- The QAPD provides adequate guidance for SNC 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 SNC to apply a QAPD to activities and items that are important to safety.

- The QAPD provides adequate guidance for SNC 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 SNC QAPD addresses VEGP 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 VEGP COL FSAR and the SNC QAPD meet the requirements of 10 CFR Part 50, Appendix B, 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 Maintenance Rule (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 VEGP COL FSAR, Revision 5, 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 VEGP 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, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," 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," 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 with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no confirmatory or open items related to the standard content in the BLN SER.

The following portion of this technical evaluation section is reproduced from Section 17.6.4 of the BLN 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 proposes to include the following license condition to address the MR program:

- License Condition (17-1) – 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 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 VEGP 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 VEGP 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 Vogtle Electric Generating Plant (VEGP) 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.[27] 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 VEGP 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 VEGP 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 VEGP 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 VEGP COL FSAR Section 18.2.1.3, the applicant provided the following:

AP1000 COL Information Item

- VEGP COL 18.2-2

The applicant provided additional information in VEGP COL 18.2-2 to address COL Information Item 18.2-2 related to the emergency operations facility (EOF). In a letter dated July 27, 2010, the applicant proposed to revise VEGP 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 and committed to revise the emergency plan to indicate that the EOF is established consistent with NUREG-0696, "Functional Criteria for Emergency Response Facilities." In addition, the applicant proposed to delete information identifying the location of the EOF from Section 18.2 of the application.

[27] 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 the FSER related to the DCD.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for VEGP 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."

The applicable regulatory requirements for VEGP COL 18.2-2 are as follows:

- Title 10 of the *Code of Federal Regulations* (10 CFR) 52.79(c)
- 10 CFR 52.79(a)(17)

The related acceptance criteria are as follows:

- NUREG-0711, "Human Factors Engineering Program Review Model," Revision 2, Section 2.4

- NUREG-0696

18.2.4 Technical Evaluation

The NRC staff reviewed Section 18.2 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 HFE program management. 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 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 with open items issued for the Bellefonte Nuclear Plant (BLN), Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from requests for additional information (RAIs) and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no confirmatory items or open items related to the standard content in the BLN SER.

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

AP1000 COL Information Item

- VEGP COL 18.2-2

In its July 31, 2009, response to the NRC staff's request for additional information (RAI) (RAI-SRP18-COLP-21), Westinghouse 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 July 27, 2010, the applicant proposed to revise Chapter 18 of the VEGP COL FSAR to indicate that the EOF and TSC communications strategies and EOF and TSC human factors attributes are addressed in the emergency plan and committed to revise the emergency plan to indicate that the EOF is established consistent with NUREG-0696. The emergency plan already indicates that the TSC is established consistent with NUREG-0696.

Operating experience with the existing common EOF facility demonstrates that the HFE aspects of the communications strategy has been effective. The effectiveness of the EOF facility communications is addressed in Section 13.3 of this SER.

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 address communications strategies and human factors attributes.

Until the applicant includes these changes in a future revision of the FSAR, this is being tracked as **Confirmatory Item 18.2-1**.

Resolution of VEGP Site-specific Confirmatory Item 18.2-1

Confirmatory Item 18.2-1 is an applicant commitment to revise its FSAR Table 1.8-202 and Sections 18.2.1.3 and 9.5.2.2.5 and Part 5, Emergency Plan to address COL Information Item STD COL 18.2-2. The staff verified that the VEGP COL FSAR and the Emergency Plan were appropriately revised. As a result, Confirmatory Item 18.2-1 is now closed.

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 (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 the Site-Specific Information Related to the Standard Content

BLN ITAAC 1.1 and 8.1 are part of the V&V approach to provide reasonable assurance that the HFE aspects of the EOF and TSC will be acceptably designed. The VEGP ESP includes the following relevant site-specific ITAAC for VEGP Units 3 and 4 that address a verification inspection to ensure functionality of the control room, EOF, and TSC prior to fuel load.

> ITAAC 1.1.1: An inspection of the control room, technical support center (TSC), and emergency operations facility (EOF) will be performed to verify that the displays for retrieving system and effluent parameters specified in Table Annex V2 D.2-1, *Hot Initiating Condition Matrix*, *Modes 1, 2, 3, and 4*; Table V2 D2-2, *Cold Initiating Condition Matrix, Modes 5, 6, and De-fueled* are installed and perform their intended functions; and that emergency implementing procedures (EIPs) have been completed.

Note: ITAAC 1.1.1 is limited to an inspection of the control room for Unit 4 due to the use of a common TSC and EOF.

> ITAAC 8.1: A full-participation exercise (test) will be conducted within the specified time periods of 10 CFR Part 50, Appendix E, ["Emergency Planning and Preparedness for Production and Utilization Facilities"].

Note: ITAAC 8.1 is reduced scope for Unit 4 due to the use of a common EOF facility.

The staff found that VEGP ITAAC 1.1.1 and VEGP ITAAC 8.1 were comparable to those proposed by BLN 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 BLN COL 18.2-2 are directly applicable to the VEGP COL application. The evaluation of these ITAAC from an emergency planning perspective is addressed in SER Section 13.3.

In VEGP COL application Part 10, "Proposed License Conditions," Revision 2, the applicant proposed License Condition 1, "ITAAC," which includes ITAAC 1.1.1 and ITAAC 8.1 from Appendix E of the VEGP ESP. The License Condition 1's proposed test is evaluated in Chapter 1 of this SER. These ITAAC will be included in the COL.

Correction to the Evaluation of Site-specific Information Text

The section above originally included 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 VEGP 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 ITAAC to ensure functionality of the EOF, and TSC HFE design:

- The licensee shall perform the following ITAAC for Unit 3:

  – ITAAC 1.1.1: An inspection of the control room, technical support center (TSC), and emergency operations facility (EOF) will be performed to verify that the displays for retrieving system and effluent parameters specified in Table Annex V2 D.2-1, *Hot Initiating Condition Matrix, Modes 1, 2, 3, and 4*; Table V2 D2-2, *Cold Initiating Condition Matrix, Modes 5, 6, and De-fueled* are installed and perform their intended functions; and that emergency implementing procedures (EIPs) have been completed.

  – ITAAC 8.1: A full-participation exercise (test) will be conducted within the specified time periods of 10 CFR Part 50, Appendix E.

- The licensee shall perform the following ITAAC for Unit 4:

  – ITAAC1.1.1: An inspection of the control room will be performed to verify that the displays for retrieving system and effluent parameters specified in Table Annex V2 D.2-1, *Hot Initiating Condition Matrix, Modes 1, 2, 3, and 4*; Table V2 D.2-2, *Cold Initiating Condition Matrix, Modes 5, 6, and Defueled*; are installed and perform their intended functions; and that emergency implementing procedures (EIPs) have been completed.

  – ITAAC 8.1: A limited-participation exercise (test) will be conducted within the specified time periods of 10 CFR Part 50, Appendix E.

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP COL FSAR is acceptable and meets the requirements of 10 CFR Part 50, "Domestic licensing of production and utilization facilities," 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, "Human Factors Engineering," of NUREG-0800. The staff based its conclusion on the following:

- VEGP 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 approved staff guidance associated with the emergency response facility design.

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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 18.6 of the AP1000 DCD, Revision 19.

In addition, in VEGP 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 the FSER related to the DCD.

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 52.79(a)(17)
- 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 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 staffing and qualification. 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 the staff's findings on standard content that were documented in the SER with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1, to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no confirmatory or open items to resolve.

Although the staff concluded that the evaluation performed for the standard content is directly applicable to the VEGP COL application, there was a difference in the information provided by the VEGP applicant from that provided by the BLN applicant regarding the plant operating experience. This difference is evaluated by the staff below, following the standard content material.

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, "Conditions of licenses."

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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 is within the scope of the DC and adequately incorporates by reference Section 18.6 of the AP1000 DCD, and meets the acceptance criteria defined in NUREG-0711, Section 6.4.

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 VEGP 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 VEGP 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 18.8 of the AP1000 DCD, Revision 19.

In addition, in VEGP COL FSAR Section 18.8, the applicant provided the following:

Tier 2 Departure

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

- VEGP DEP 18.8-1 addresses the location of the TSC and Operational Support Center (OSC). The applicant noted in FSAR Section 18.8 that this departure is also associated with VEGP ESP Permit Condition 8.

18.8.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the FSER related to the DCD.

In addition, the acceptance criteria associated with the relevant requirements of the Commission regulations for VEGP DEP 18.8-1 are given in Chapter 18 of NUREG-0800.

The applicable regulatory requirements for VEGP 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)

- 10 CFR 52.79(a)(17)

18.8.4 Technical Evaluation

The NRC staff reviewed Section 18.8 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 HSI design. 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.

The staff reviewed the information in the VEGP COL FSAR:

Tier 2 Departure

- VEGP DEP 18.8-1

HFE design implementation in the TSC is not location-dependent. Therefore, the location change 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 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 the SER Section 13.3, "Emergency Planning."

The location changes have the potential to affect technical data availability, communications, power supply reliability, security, and habitability. The acceptability of the location changes relative to these attributes is addressed 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 18.10 of the AP1000 DCD, Revision 19.

In addition, in VEGP 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 the FSER related to the DCD.

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)
- 10 CFR 52.79(a)(17)

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 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 training program development. 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 the staff's findings on standard content that were documented in the SER with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1, to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no confirmatory or open items to resolve.

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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 VEGP 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 VEGP 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 VEGP 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 shut down the reactor and maintain it shutdown is also identified.

Section 18.12 of the VEGP 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 VEGP 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 VEGP 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 VEGP 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 18.14 of the AP1000 DCD, Revision 19.

In addition, in VEGP 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 the FSER related to the DCD.

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)
- 10 CFR 52.79(a)(17)

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 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 human performance monitoring. 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 the staff's findings on standard content that were documented in the SER with open items issued for the BLN Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1, to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were no confirmatory or open items to resolve.

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

In addition, the staff concludes that the relevant information presented in the VEGP 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 Vogtle Electric Generating Plant (VEGP) 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.[28] 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 VEGP COL application are documented in NUREG-1793, “Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design,” (FSER) and its supplements.

[28] 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.

For the remaining sections of Chapter 19, NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants,” 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 VEGP COL FSAR and found that due to the site-specific design response spectra exceedances discussed below, incorporation of DCD Section 19.55 by reference, with no departures or supplements, was insufficient.

The seismic analysis and design of the AP1000 plant is based on the certified seismic design response spectra (CSDRS) shown in 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.

The VEGP Units 3 and 4 soil conditions and ground motion response spectra (GMRS) are described in VEGP COL FSAR Sections 2.5 and 3.7. In FSAR Figures 3.7-201 and 3.7-202, the VEGP GMRS are compared with the AP1000 CSDRS. These comparisons indicated that the site-specific GRMS exceed the AP1000 CSDRS in the high and low frequency ranges. In FSAR Appendix 3GG, “3-D SSI Analysis of AP1000 at Vogtle Site using NI15 Model for VEGP Units 3 & 4,” the applicant described the detailed soil-structure interaction analysis performed to justify that the VEGP GMRS excitation will not damage seismic structures, systems, or components (SSCs). The staff’s review of these analyses are provided in Section 3.7 of this safety evaluation report (SER).

The staff’s review of the AP1000 PRA-based seismic margin analysis (SMA) is described in Section 19.1.5.1 of NUREG-1793. 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 for the SMA and used to demonstrate a margin over the SSE of 0.3 g.

The AP1000 DCD, Tier 1, Table 5.0-1, "Site Parameters," states:

> If the site-specific spectra exceed the response spectra in Figures 5.0-1 and 5.0-2 at any frequency, or if soil conditions are outside the range evaluated for AP1000 design certification, a site-specific evaluation can be performed. This evaluation will consist of a site-specific dynamic analysis and generation of in-structure response spectra at key locations to be compared with the floor response spectra of the certified design at 5-percent damping. The site is acceptable if the floor response spectra from the site-specific evaluation do not exceed the AP1000 spectra for each of the locations or the exceedances are justified.

19.55.2 Summary of Application

Section 19.55 of the VEGP COL FSAR, Revision 5, incorporates by reference Section 19.55 of the AP1000 DCD, Revision 19. In a letter dated September 20, 2010, the applicant proposed to supplement the application with a new Section 19.55.6.3, "Site Specific Seismic Margin Analysis." This section provides the basis for the applicant's conclusion that the SMA documented in Section 19.55 of the DCD is applicable to the VEGP site. The advanced safety evaluation (ASE) with confirmatory items for Section 19.55 was based on the VEGP 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.

- VEGP COL 19.59.10-6

In a letter dated September 20, 2010, the applicant proposed to add a new COL Information Item 9 (VEGP COL 19.59.10-6) to reflect a response from Westinghouse dated August 23, 2010, regarding confirmation that the SMA documented in the AP1000 DCD section is applicable to the VEGP site.

19.55.3 Regulatory Basis

The regulatory basis of the information incorporated by reference is addressed in the FSER related to the DCD.

In addition, the applicable regulatory requirements for the evaluation of plant-specific information evaluated in Section 19.55 of this 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 in the form of 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 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 the VEGP COL FSAR and found that due to the site-specific design response spectra exceedances, incorporation of DCD Section 19.55 by reference was insufficient. Although the applicant performed site-specific soil-structure interaction analysis to demonstrate that the VEGP GMRS will not damage seismic SSCs for design basis seismic loading, there was no mention of beyond-design basis loading such as that described in SECY-93-087. The associated SRM states that at the plant level, the HCLPF should be at least 1.67 times the ground motion acceleration of the site-specific GMRS.

To address the above concern, the staff issued a request for additional information (RAI) demonstrating that VEGP will have adequate seismic margin as described in SECY-93-087 (RAI 19-10). In response to this request, in a letter dated October 30, 2009, the applicant provided an evaluation of site-specific features with the potential to reduce seismic margin. The applicant evaluated the potential for soil liquefaction and its effect on bearing capacity as well as nuclear island seismic demand, and seismic stability.

<u>Soil Liquefaction and Bearing Capacity</u>

The applicant stated that the increased seismic demand (i.e., 1.67 times the GMRS) results in a PGA of 0.44 g on subsurface soils beneath VEGP Units 3 and 4. Further, the applicant stated that the subsurface materials are dense compacted structural fill that would not be expected to

liquefy at acceleration values less than or equal to 0.44 g. The applicant also assessed the liquefaction potential of the Blue Bluff marl (BBM), which is approximately 86 feet below plant grade elevation. The applicant stated that the BBM is not susceptible to liquefaction because the BBM is a highly over-consolidated, very strong middle-Eocene–age material consisting almost entirely of clay with some partially cemented, well indurated lenses.

The applicant stated that in terms of bearing capacity, the increased seismic demand will reduce average site-specific ultimate dynamic bearing capacity, while the seismic bearing pressure will increase. Using these assumptions, the applicant predicted that the resulting capacity-to-demand ratio will still be more than 2.0 and, therefore, will provide sufficient margin for the beyond-design basis seismic loading.

The staff reviewed the applicant's evaluations of soil liquefaction and bearing capacity of the soils supporting the nuclear island and finds them to be consistent with RG 1.198, "Procedures and Criteria for Assessing Seismic Soil Liquefaction at Nuclear Power Plant Sites," and NUREG-0800 Section 3.8.5, "Foundations." Therefore, the staff finds the applicant's response regarding soil liquefaction and bearing capacity to be acceptable.

Nuclear Island Seismic Demand

The staff reviewed the applicant's response to RAI 19-10 and noted that the applicant did not perform an explicit analysis of the effects of the 0.5 g RLE on in-structure response spectra. Instead, the applicant makes the case that the exceedances of the AP1000 CSDRS are non-damaging because they either: (1) occur in a frequency range above tank sloshing resonance; or (2) occur at locations where there are no SSCs having resonances in the exceeded frequency range.

To evaluate the site-specific exceedances of the AP1000 CSDRS, the applicant performed two-dimensional (2-D) soil-structure interaction analyses in support of the early site permit (ESP). The applicant performed three-dimensional (3-D) soil-structure interaction analyses for design-basis loading. The 2-D analyses are described in VEGP Early Site Permit Application Site Safety Analysis Report, Revision 5, Appendix 2.5E, "Vogtle Site Specific Seismic Evaluation Report." The 3-D analyses are described in VEGP COL FSAR Appendix 3GG. To support the applicant's ESP, the staff previously reviewed and approved the applicant's 2-D analyses for the purpose of confirming adequate foundation stability. The staff noted in Section 3.7 of NUREG-1923, "Safety Evaluation Report for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant (VEGP) ESP Site," that 3-D analyses are required for assessing in-structure response. The applicant's response to RAI 19-10 states that the 3-D analyses show small exceedances of the envelope spectra at two of the six key locations specified in the DCD. These exceedances occur in the frequency ranges of 0.5 to 0.6 Hz in the north-south direction, 0.45 to 0.65 Hz in the east-west direction, and 1.5 to 2 Hz at high elevations in the shield building in the east-west directions. With respect to the exceedances below 1.0 Hz, the applicant claims that these are due to tank sloshing and that the sloshing resonances are below 0.5 Hz. With respect to the exceedances in the 1.5-2 Hz range, the applicant states that Westinghouse reviewed the seismic Category I SSCs above this elevation and concluded that there are no items with fundamental frequencies in this range. Therefore, these exceedances have no impact on the design.

The staff reviewed the results of the applicant's site-specific seismic analyses in Section 3.7 of this SER. Westinghouse proposed design changes to the AP1000 shield building. These changes were reflected in the site-specific VEGP analysis models. The staff's evaluation of the

modified shield building design and site-specific analysis models for VEGP is documented in Section 3.7 of this safety evaluation.

Seismic Stability

To assess the sliding stability of the nuclear island when subjected to seismic ground motion equal to 1.67 times the VEGP GMRS, the applicant compared the factors of safety provided in VEGP ESP SSAR Appendix 2.5E, Table 6.2-1. The applicant states that in the ESP, the upper bound case for the east-west response has the smallest factor of safety, which is equal to 2.45. Increasing the seismic demand by 1.67 reduced the factor of safety to 1.4, conservatively neglecting the effects of passive soil pressure.

The staff reviewed the applicant's technical basis for assessing sliding and overturning stability. The staff also reviewed VEGP ESP SSAR Appendix 2.5E, Tables 6.2-1, 6.2-2, and 6.2-3 and found the smallest factor of safety to resist sliding and overturning (based on best-estimate soil properties) to be 1.78 and 2.15, respectively. Based on these results, the staff finds the applicant's response regarding seismic stability to be acceptable.

The staff reviewed the applicant's analysis of the potential for soil liquefaction and its effect on bearing capacity as well as nuclear island seismic demand and seismic stability. The staff concludes that the applicant has adequately evaluated site-specific features with the potential to reduce seismic margin. The incorporation of the planned changes to the VEGP COL FSAR identified in the applicant's September 20, 2010, letter will be tracked as **Confirmatory Item 19.55-1**.

Resolution of VEGP 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 the COL Information Item STD COL 19.59.10-1 and a new COL Information Item STD COL 19.59.10-6. The staff verified that the VEGP 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 identified that the applicant needed to perform a site-specific evaluation to confirm adequate seismic margin in accordance with SECY-93-087. The applicant adequately addressed the site-specific evaluation of soil liquefaction, bearing capacity, and nuclear island stability.

19.58 Winds, Floods, and Other External Events

19.58.1 Introduction

Section 19.58 of the VEGP 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 VEGP 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 19.58 of the AP1000 DCD, Revision 19.

In addition, in VEGP COL FSAR Section 19.58, the applicant provided the following:

Supplemental Information

- VEGP Supplement (SUP) 19.58-1

The applicant provided supplemental information to address a portion of COL Information Item 19.59.10-2 by adding text to the end of DCD Section 19.58.3. Table 19.58-201, "External Event Screening for VEGP," documents the site-specific external events evaluation that has been performed for VEGP Units 3 and 4. 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 VEGP Units 3 and 4 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 the FSER related to the DCD.

In addition, the applicable regulatory requirements for the evaluation of VEGP SUP 19.58-1 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."

Additional guidance is found in the following documents:

- 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 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.

19.58.4 Technical Evaluation

The NRC staff reviewed Section 19.58 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 winds, floods, and other external events. 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.

The staff reviewed the information in the VEGP COL FSAR:

Supplemental Information

- VEGP SUP 19.58-1

The NRC staff reviewed VEGP SUP 19.58-1 related to COL Information Item 19.59.10-2.

In support of the AP1000 design certification amendment (DCA), 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.

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 the VEGP COL FSAR the applicant provided VEGP SUP 19.58-1, which included the following paragraph:

> Table 19.58-201 documents the site-specific external events evaluation that has been performed for VEGP Units 3 and 4. This table provides a general explanation of the evaluation and resultant conclusions and provides a reference to applicable sections of the COL where more supporting information (including data used, methods and key assumptions) regarding the specific event is located. Based upon this evaluation, it is concluded that the VEGP Units 3 and 4 site is bounded by the High Winds, Floods and Other External Events analysis documented in DCD Section 19.58 and APP-GW-GLR-101 ([FSAR] Reference 201) and no further evaluations are required at the COL application stage.

Staff Request for Additional Information

Although site-specific information at currently proposed AP1000 sites was considered in performing the generic analyses of DCD Section 19.58, details were not made available to the staff. The staff issued RAI 19-1, requesting the applicant provide sufficient information to confirm the basis for concluding that the VEGP site was bounded by the generic analysis.

In a letter dated February 10, 2009, the applicant, in response to RAI 19-1, described the methodology used to develop the generic external event analysis and provided some additional information on event frequency and severity.

Potential external events and hazards were first screened for applicability to the VEGP 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 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 VEGP 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 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 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 $1x10^{-7}$ /year). Events that may occur more frequently but less than once in a million years ($1x10^{-7}$frequency less than $1x10^{-6}$/year) are

assessed to determine that their consequences make a negligible contribution to CDF (change CDF less than $1x10^{-8}$/year). Other events, if any, must be explicitly evaluated and included in the plant-specific PRA.

Because a number of questions remained, 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 VEGP site (RAIs 19-3 through 19-9):

- RAI 19-3 requested (a) the basis for screening and (b) assessment of risk from events that cannot be screened (to be reported in the FSAR).

- RAI 19-4 requested clarification of the frequency of extratropical cyclones.

- RAI 19-5 requested additional discussion of the basis for the VEGP assessment of external flooding.

- RAI 19-6 requested the basis for screening of external fires.

- RAI 19-7 requested additional discussion of risk related to onsite chemical storage.

- RAI 19-8 requested discussion of risk related to nearby facilities.

- RAI 19-9 requested discussion of risk related to the release of toxic materials.

In a letter dated May 22, 2009, the applicant responded to these RAIs 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 include it in the VEGP COL FSAR as Table 19.58-20, "External Event Screening for VEGP," to document the basis for its assessment of risk related to winds, floods, and other external events. This table has been incorporated into the VEGP COL FSAR.

A summary of the staff's review of each of the external event categories in the table follows.

Winds that would threaten safety-related SSCs (exceed 300 miles per hour)

VEGP safety-related SSCs are designed to withstand winds of 300 mph. When the AP1000 was certified, the COL applicant was required to confirm the design assumption that high wind events exceeding 300 mph are extremely rare (frequency $<1x10^{-7}$/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 $1x10^{-7}$/year 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 VEGP site may 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.

The applicant found this external event category applicable to the VEGP site, and estimated frequencies for tornadoes striking the seven counties around the site. The applicant's estimated frequency for each class of tornado (on the enhanced Fujita scale) is less than what is assumed in Section 19.58 of the AP1000 DCD.

In response to RAI 19-1, the applicant reported that the large structure strike probability from any tornado at the VEGP site is 7.74×10^{-5}/year and assumed this frequency for each class of tornado. This event was evaluated in the VEGP ESP SSAR and, subsequently, found acceptable by the staff in Section 2.3.1 of NUREG-1923. The NRC staff compared the analyses presented in both the VEGP ESP SSAR and the information presented in response to RAIs 19-1 and 19-4, and found them to follow essentially identical logic. Therefore, the conclusions reached in NUREG-1923 related to tornadoes are directly applicable to the VEGP COL application.

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 19-1, the applicant identified this external event category as applicable to the VEGP site. In response to RAI 19-4, the applicant clarified the frequency of extratropical cyclones and stated that all events with winds below hurricane force had been screened out from further evaluation.

This event was also evaluated in the VEGP ESP SSAR and, subsequently, found acceptable by the staff in Section 2.3.1 of NUREG-1923. The NRC staff compared the analyses presented in both the VEGP ESP SSAR and the information presented in response to RAIs 19-1 and 19-4, and found them to follow essentially identical logic. Therefore, the conclusions reached in NUREG-1923 related to hurricanes and extratropical cyclones are directly applicable to the VEGP COL application.

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.

In response to RAI 19-1, the applicant identified this external event category as applicable to the VEGP site. In response to RAI 19-5, the applicant considered additional sources of flooding and provided justification for considering the VEGP site to be bounded by the AP1000 DCD.

This event was also evaluated in the VEGP ESP SSAR and, subsequently, found acceptable by the staff in Section 2.3.4 of NUREG-1923. The NRC staff compared the analyses presented in both the VEGP ESP SSAR and the information presented in response to RAIs 19-1 and 19-5, and found them to follow essentially identical logic. Therefore, the conclusions reached in NUREG-1923 related to the event of external floods are directly applicable to the VEGP COL application.

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}/year by small aircraft and 1.0×10^{-7}/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 non-safety-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. Because of the uncertainty of the consequences of the impact, the acceptable screening criterion for large, commercial aircraft is to demonstrate an accidental impact frequency of 1.0×10^{-7}/year or less.

In response to RAI 19-1, the applicant identified this event category as not applicable to the VEGP site, and referenced VEGP ESP SSAR Section 3.5.1.6, which provides details of aircraft impact analysis. The applicant determined that Airway V185 is the only one affected. The applicant determined 51,000 flights per year would be needed in order to reach the 1.0×10^{-7}/year threshold. This exceeds the total number of flights expected to utilize the airway.

This event was also evaluated in the VEGP ESP SSAR and, subsequently, found acceptable by the staff in Section 3.5.1.6 of NUREG-1923. The NRC staff compared the analyses presented in both the VEGP ESP SSAR and the information presented in response to RAI 19-1, and found them to follow essentially identical logic. Therefore, the conclusions reached in NUREG-1923 related to aviation accidents are directly applicable to the VEGP COL application.

Transportation and Nearby Facility Accidents—Marine Accidents

The applicant is expected to verify that the limiting initiating event frequency of 1×10^{-6}/year is not exceeded for the release of toxic materials toward the plant (which can affect plant and control room habitability). This is not a screening based on frequency alone; it also considers consequence. It is predicated on a very low conditional core damage probability when there is no operator action or no operator action after tripping the reactor.

In response to RAI 19-1, the applicant found that this event category was not applicable to the VEGP site. The applicant referenced VEGP ESP SSAR Section 2.2.3.3.1 and stated that no barge traffic exists by the VEGP site.

This event was also evaluated in the VEGP ESP SSAR and, subsequently, found acceptable by the staff in Section 2.2.2 of NUREG-1923. The NRC staff compared the analyses presented in both the VEGP ESP SSAR and the information presented in response to RAI 19-1, and found them to follow essentially identical logic. Therefore, the conclusions reached in NUREG-1923 related to marine accidents are directly applicable to the VEGP COL application.

Transportation and Nearby Facility Accidents—Rail Accidents

As in the case of marine-based hazards, there are two event subcategories of rail-based hazards: toxic materials and explosive hazards.

In response to RAI 19-1, the applicant found that neither event category applies to the VEGP site. Accordingly, the applicant does not discuss the toxic materials event subcategory. The safe standoff distance for an explosive hazard (based on a tank car of trinitrotoluene) is less than the distance from the site boundary to the nearest railway.

In response to RAI 19-9, the applicant referenced VEGP ESP SSAR Section 2.2.3.1.4, which provides a more detailed analysis of this scenario.

This event was also evaluated in the VEGP ESP SSAR and, subsequently, found acceptable by the staff in Section 2.2.3 of NUREG-1923. The NRC staff compared the analyses presented in both the VEGP ESP SSAR and the information presented in response to RAI 19-1 and RAI 19-9, and found them to follow essentially identical logic. Therefore, the conclusions reached in NUREG-1923 related to rail accidents are directly applicable to the VEGP COL application.

Transportation and Nearby Facility Accidents—Truck Accidents

Similar to rail and marine accidents, there are two event subcategories of truck-based hazards: toxic materials and explosive hazards. In response to RAI 19-1, the applicant states truck accidents are not applicable to the VEGP site. Accordingly, the applicant does not discuss the toxic materials event subcategory. As previously noted, RAI 19-9 was issued to the applicant to provide an evaluation of this subcategory for all mobile sources, including truck traffic, and to document the assessment of associated risk in Section 19.58 of the VEGP COL FSAR.

The applicant's response to RAI 19-1 with respect to truck-based explosive and flammable vapor cloud hazards is similar to that for rail-based hazards, and it concluded that the safe standoff distance for an explosive hazard is less than the distance from the site boundary to the nearest highway.

Additionally, in response to RAI 19-9, the applicant referenced VEGP ESP SSAR Section 2.2.3.1.1 and Section 2.2.3.2.1, which provide a more detailed analysis of this scenario.

This event was also evaluated in the VEGP ESP SSAR and, subsequently, found acceptable by the staff in Section 2.2.3 of NUREG-1923. The NRC staff compared the analyses presented in both the VEGP ESP SSAR and the information presented in response to RAI 19-1 and RAI 19-9, and found them to follow essentially identical logic. Therefore, the conclusions reached in NUREG-1923 related to truck accidents are directly applicable to the VEGP COL application.

Transportation and Nearby Facility Accidents—Pipelines

In response to RAI 19-1, the applicant states that there are no major pipelines within five miles of the VEGP site and references VEGP ESP SSAR Section 2.2.3.1.3. The position of the staff is that a release of hazardous material beyond this distance need not be considered in accordance with NUREG-0800, Section 2.2.1-2.2.2. The staff confirmed that residential, commercial, and industrial distribution pipelines within five miles of the site do not constitute major pipelines. Because the limiting event evaluated for pipeline-related explosion in the DCD was a 76 cm (30-inch) pipe at a distance of 1700 m (5800 feet) from the plant, the applicant states that explosion hazards due to pipeline accidents can be screened.

This event was evaluated in the VEGP ESP SSAR and, subsequently, found acceptable by the staff in Section 2.2.3 of NUREG-1923. The NRC staff compared the analyses presented in both the VEGP ESP SSAR and the information presented in response to RAI 19-1, and found them to follow essentially identical logic. Therefore, the conclusions reached in NUREG-1923 related to pipelines are directly applicable to the VEGP COL application.

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." RAI 19-8 was issued requesting additional information about the toxic and explosive hazards associated with nearby facilities.

In response to RAI 19-8, the applicant referenced Section 2.2.3.2.2 of the VEGP ESP SSAR, the military and industrial facilities within five miles of the plant are identified, the inventories of hazardous materials associated with each one are documented, and the potential consequences of release are evaluated. The applicant found the potential consequences to have negligible effects on safety. The applicant also proposed to document the basis for screening these sources from further evaluation.

This event was evaluated in the VEGP ESP SSAR and, subsequently, found acceptable by the staff in Section 2.2.3 of NUREG-1923. The NRC staff compared the analyses presented in both the VEGP ESP SSAR and the information presented in response to RAI 19-1 and RAI 19-9, and found them to follow essentially identical logic. Therefore, the conclusions reached in NUREG-1923 related to nearby facility accidents are directly applicable to the VEGP COL application.

External Fires

The 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 $1x10^{-7}$/year. The NRC issued RAI 19-6 to request documentation of this re-evaluation or assessment in the VEGP COL FSAR.

External fires are discussed in VEGP ESP SSAR Section 2.2.3.3 and VEGP 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. In response to RAI 19-6, the applicant proposed to document the basis for screening these sources from further evaluation, and subsequently revised the VEGP COL FSAR to do so.

This event was evaluated in the VEGP ESP SSAR and, subsequently, found acceptable by the staff in Section 2.2.3 of NUREG-1923. The NRC staff compared the analyses presented in both the VEGP ESP SSAR and the information presented in response to RAI 19-1 and RAI 19-6, and found them to follow essentially identical logic. Section 2.2.3.3 of the VEGP COL FSAR includes information that supplements the discussion of external fires in VEGP ESP SSAR Section 2.2.3.3. The NRC staff has reviewed this information and concludes that it clarifies information presented in the VEGP ESP SSAR. Furthermore, the staff finds that the conclusions reached in Section 2.2.3 of NUREG-1923 remain valid. Therefore, the conclusions reached in NUREG-1923 related to external fires are directly applicable to the VEGP COL application.

Summary

Based on this additional information, the staff confirmed that the AP1000 DCD external events analysis envelops the reported parameters of the VEGP site. The staff concludes that the incorporation of AP1000 DCD Section 19.58 by reference with plant-specific supplemental information is acceptable, resolving RAIs 19-1 and 19-3 through 19-9.

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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the relevant information presented in VEGP SUP 19.58-1 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 VEGP COL FSAR, Revision 5, incorporates by reference Section 19.59 of the AP1000 DCD, Revision 19.

In addition, in VEGP 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. In a letter dated September 20, 2010, the applicant proposed to revise item 1 of the COL information item to reflect a revision to the DCD proposed by Westinghouse in a letter dated August 23, 2010.

- STD COL 19.59.10-2

The applicant provided additional information in STD COL 19.59.10-2 to address a portion of 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 licensee'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 as part of the review of VEGP SUP 19.58-1.

- 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).

- STD COL 19.59.10-6 and VEGP COL 19.59.10-6

In a letter dated September 20, 2010, the applicant proposed to add COL Information Items (STD COL 19.59.10-6 and VEGP 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 VEGP site. These COL information items are evaluated in SER Section 19.55.4.

Section 19.59 of the VEGP 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 VEGP 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 and 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 the FSER related to the DCD.

In addition, the following regulations apply to Sections 19.59.10.5 and 19.59.10.6 of the VEGP 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 with open items issued for the Bellefonte Nuclear Plant (BLN) Units 3 and 4 COL application were equally applicable to the VEGP Units 3 and 4 COL application, the staff undertook the following reviews:

- The staff compared the BLN COL FSAR, Revision 1 to the VEGP COL FSAR. In performing this comparison, the staff considered changes made to the VEGP COL FSAR (and other parts of the COL application, as applicable) resulting from RAIs and open and confirmatory items identified in the BLN SER with open items.

- The staff confirmed that all responses to RAIs identified in the corresponding standard content (the BLN SER) 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 VEGP COL application. This standard content material is identified in this SER by use of italicized, double-indented formatting. There were two confirmatory items (Confirmatory Items 19.59-1 and 19.59-2) related to the standard content in the BLN SER. Their resolution is addressed in this SER.

The following portion of this technical evaluation section is reproduced from Section 19.59.4 of the BLN 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 VEGP 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, meet those 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 VEGP PRA will be updated to account for VEGP 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 VEGP COL FSAR Section 19.59.10.6. 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 VEGP COL FSAR Section 19.59.10.6 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 this 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 VEGP 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 BLN 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.

COL Action Items from Chapter 19 of NUREG-1793

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:

RAI 19-6

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 seismic margin analysis 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 license 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 VEGP COL FSAR related to this section. The results of the NRC staff's technical evaluation of the information incorporated by reference in the VEGP COL application are documented in NUREG-1793 and its supplements.

The staff concludes that the relevant information presented in Section 19.59 of the VEGP 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 May 29, 2009, the Southern Nuclear Operating Company (SNC) submitted Revision 0 of the Loss of Large Areas of the Plant Due to Explosions or Fire Mitigative Strategies Description and Plans (MSD) for Vogtle Electric Generating Plant (VEGP) Units 3 and 4.

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 safety evaluation (SE) section (Attachment A), as well as some documents referenced in this 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 May 29, 2009 (not publically available), the applicant for the VEGP COL application 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 VEGP COL application. The redacted version of this MSD will be incorporated into a future revision to Part 11 of the VEGP 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 VEGP 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 VEGP Units 3 and 4 submittal is found in Attachment A to Appendix 19.A.

The VEGP 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 May 29, 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 VEGP Units 3 and 4. 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[29], 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.

[29] 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.

The NRC staff has identified as **Confirmatory Item 19.A-1** the revisions to Parts 9 and 11 of the VEGP COL application to include the MSD proposed by the applicant in its May 29, 2009, letter, as modified in its letter dated November 12, 2010. The specific modifications to the MSD are discussed in detail in Attachment A to Appendix 19.A of this SER.

Resolution of VEGP Site-Specific Confirmatory Item 19.A-1

Confirmatory Item 19.A-1 is an applicant commitment to revise its MSD under Parts 9 and 11 to its COL application to incorporate the described changes. The staff verified that the MSD under Parts 9 and 11 of the VEGP COL application was appropriately revised. As a result, Confirmatory Item 19.A-1 is now closed.

License Conditions

- Part 10, License Condition 6

In RAI 19-95 the staff asked the applicant 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, the applicant 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, the proposed license condition is consistent with the policy established in SECY-05-0197 for operational programs in general, and is acceptable. Thus, this RAI is closed.

- Managing MSD Commitments

In RAI 19-96 the staff asked the applicant to describe its plans for managing changes to the commitments included in the MSD. In its response dated May 24, 2010, the applicant 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. 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 contained 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 conditions:

- 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 the Office of the 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 loading, 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 with10 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 VEGP 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 VEGP Units 3 and 4, respectively.

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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 Southern Nuclear Operating Company (SNC or the applicant), for the Vogtle Electric Generating Plant (VEGP) Units 3 and 4. The FSER also documents the NRC staff's technical review of the limited work authorization (LWA) activities for which SNC has requested approval.

By letter dated March 28, 2008, SNC 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 VEGP Units 3 and 4, and will be located on the existing VEGP site in Burke County, Georgia. In October 2009, SNC supplemented its COL application to include a request for an LWA.

This FSER presents the results of the staff's review of information submitted in conjunction with the COL and LWA application.

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)

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