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NUREG-2111, Vol. 2

Final Environmental Impact Statement for Combined Licenses (COLs) for William States Lee III Nuclear Station Units 1 and 2

U.S. Nuclear Regulatory Commission
Office of New Reactors
Washington, DC 20555-0001

Regulatory Division
Special Projects Branch
Charleston District
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Charleston, SC 29403-5107

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Abstract

This environmental impact statement (EIS) has been prepared in response to an application submitted to the U.S. Nuclear Regulatory Commission (NRC) by Duke Energy Carolinas, LLC (Duke) for two combined construction permits and operating licenses (combined licenses or COLs). The proposed actions requested in Duke's application are (1) NRC issuance of COLs for two nuclear power reactors at the William States Lee III Nuclear Station (Lee Nuclear Station) site in Cherokee County, South Carolina, and (2) U.S. Army Corps of Engineers (USACE) permit action on a Department of the Army individual permit application to perform certain construction activities on the site. The USACE is participating with the NRC in preparing this EIS as a cooperating agency and participates collaboratively on the review team.

This EIS includes the review team's analysis that considers and weighs the environmental impacts of building and operating two new nuclear units at the proposed Lee Nuclear Station site and at alternative sites, and mitigation measures available for reducing or avoiding adverse impacts. The EIS also addresses Federally listed species, cultural resources, and plant cooling-system design alternatives.

The EIS includes the evaluation of the proposed project's impacts on waters of the United States pursuant to Section 404 of the Clean Water Act. The USACE will conduct a public interest review in accordance with the guidelines promulgated by the U.S. Environmental Protection Agency under authority of Section 404(b) of the Clean Water Act. The public interest review, which will be addressed in the USACE's permit decision document, will include an alternatives analysis to determine the least environmentally damaging practicable alternative.

After considering the environmental aspects of the proposed NRC action, the NRC staff's recommendation to the Commission is that the COLs be issued as requested.[a] This recommendation is based on (1) the application, including Revision 1 of the environmental report (ER) and the supplement to the ER, submitted by Duke; (2) consultation with Federal, State, Tribal, and local agencies; (3) the staff's independent review; (4) the staff's consideration of comments related to the environmental review that were received during the two public scoping processes and the draft EIS comment period; and (5) the assessments summarized in this EIS, including the potential mitigation measures identified in the ER and this EIS. The USACE will issue its Record of Decision based, in part, on this EIS.

(a) As directed by the Commission in CLI-12-16, the NRC will not issue the COLs prior to completion of the ongoing rulemaking to update the Waste Confidence Decision and Rule (see Section 6.1.6 of this EIS).

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Executive Summary

This environmental impact statement (EIS) presents the results of an U.S. Nuclear Regulatory Commission (NRC) environmental review of an application for combined construction permits and operating licenses (combined licenses or COLs) for two new nuclear reactor units at a proposed site in Cherokee County, South Carolina. The U.S. Army Corps of Engineers (USACE) participated in the preparation of the EIS as a cooperating agency and as a member of the review team, which consisted of the NRC staff, its contractor staff, and the USACE staff.

Background

On December 12, 2007, Duke Energy Carolinas, LLC (Duke), submitted an application to the NRC for COLs for William States Lee III Nuclear Station (Lee Nuclear Station) Units 1 and 2 in Cherokee County, South Carolina. The application was revised (Revision 1) by a letter dated March 30, 2009, and a supplement to the environmental report (ER) was submitted on September 24, 2009, describing Duke's plans to construct and operate an additional offsite reservoir (known as Make-Up Pond C) as a source of supplemental cooling water for the proposed station.

Upon docketing of Duke's initial application, the NRC review team began the environmental review process as described in 10 CFR Part 51 by publishing in the *Federal Register* on March 20, 2008, a Notice of Intent to prepare an EIS and conduct scoping. With the submittal of the September 2009 supplement to the ER, a second Notice of Intent to conduct a supplemental scoping process was published in the *Federal Register* on May 24, 2010. As part of the environmental review, the review team:

- considered comments received during the 60-day scoping process beginning March 20, 2008, and conducted related public scoping meetings on May 1, 2008 in Gaffney, South Carolina.
- considered comments received during a supplemental scoping period specific to Make-Up Pond C from May 24, 2010 through July 2, 2010, and conducted a related public scoping meeting on June 17, 2010, also in Gaffney, South Carolina.
- conducted site audits from April 28, 2008 through May 2, 2008 and from August 9, 2010 through August 13, 2010.
- conducted public meetings on the draft EIS on January 19, 2011 in Gaffney, South Carolina. The review team also considered comments received during the 75-day comment period for the draft EIS beginning on December 12, 2011.

- reviewed Duke's ER and Supplemental ER and developed requests for additional information (RAIs) using guidance from NUREG-1555, "Standard Review Plans for Environmental Reviews for Nuclear Power Plants."
- consulted with American Indian Tribes and Federal and State agencies such as U.S. Fish and Wildlife Service, Advisory Council on Historic Preservation, National Marine Fisheries Service, Federal Energy Regulatory Commission, South Carolina Department of Natural Resources, South Carolina Department of Health and Environmental Control, and South Carolina Archives and History Center.

Proposed Action

The proposed actions related to the Lee Nuclear Station Units 1 and 2 application are (1) NRC issuance of COLs for construction and operation of two new nuclear plants at the Lee Nuclear Station site and (2) USACE issuance of a permit pursuant to Section 404 of the Federal Water Pollution Control Act (Clean Water Act) as amended to perform certain construction activities on the site.

Purpose and Need for Action

The purpose of the proposed action—issuance of the COLs—is to construct and operate two new nuclear units to provide for additional baseload electric generating capacity in 2024 and 2026 within Duke's service territories. The objective of Duke's requested USACE action is to obtain a Department of the Army individual permit to perform regulated dredge-and-fill activities that would affect wetlands and other waters of the United States.

Public Involvement

A 60-day scoping period was held from March 20, 2008 through May 20, 2008. A supplemental scoping period specific to Make-Up Pond C was held from May 24, 2010 through July 2, 2010. On June 17, 2010, the NRC held supplemental public scoping meetings in Gaffney, South Carolina. The review team received many oral comments during the public meetings and a total of 35 e-mails and 14 letters from both scoping periods on topics such as surface-water hydrology, ecology, socioeconomics, uranium fuel cycle, energy alternatives, and benefit-cost balance.

Additionally, on January 19, 2012, during the 75-day comment period on the draft EIS, the review team held public meetings in Gaffney, South Carolina. Approximately 250 people attended the public meetings and many provided oral comments.

Affected Environment

As proposed, the Lee Nuclear Station would be constructed in Cherokee County, South Carolina, on the same site as the former Duke Power Company Cherokee Nuclear Station. The site is 8 mi southeast of Gaffney, South Carolina and 25 mi northeast of Spartanburg, South Carolina. The area around the site is shown in Figure ES-1.

Cooling water for the units would be obtained from the Broad River. Makeup water from the Broad River would be provided to the plant via Make-Up Pond A. During periods of low flow when withdrawals from the Broad River are limited, makeup water would be provided from Make-Up Ponds B and C to Make-Up Pond A. Make-Up Ponds A and B already exist on the Lee Nuclear Station site. Make-Up Pond C would be built on the London Creek watershed to the northeast of the site. Construction of Make-Up Pond C would disturb approximately 1100 ac with permanent or temporary loss and alteration from flooding and clearing.

The Lee Nuclear Station would use mechanical draft cooling towers to transfer waste heat to the atmosphere. A portion of the water obtained from the Broad River would be returned to the environment via a discharge structure located in the Broad River on the upstream side of Ninety-Nine Islands Dam. The remaining portion of the water would be released to the atmosphere via evaporative cooling.

Evaluation of Environmental Impacts

When evaluating the environmental impacts associated with nuclear power plant construction and operations, the NRC's authority is limited to construction activities related to radiological health and safety or common defense and security; that is, NRC-authorized activities are related to safety-related structures, systems, or components, and may include pile driving; subsurface preparation; placement of backfill, concrete, or permanent retaining walls within an excavation; installation of foundations; or in-place assembly, erection, fabrication, or testing. In this EIS, the NRC review team evaluates the potential environmental impacts of the construction and operation of two new nuclear units for the following resource areas:

- land use
- air quality
- aquatic ecology
- terrestrial ecology
- surface and groundwater
- waste (radiological and nonradiological)
- human health (radiological and nonradiological)
- socioeconomics
- environmental justice
- cultural resources

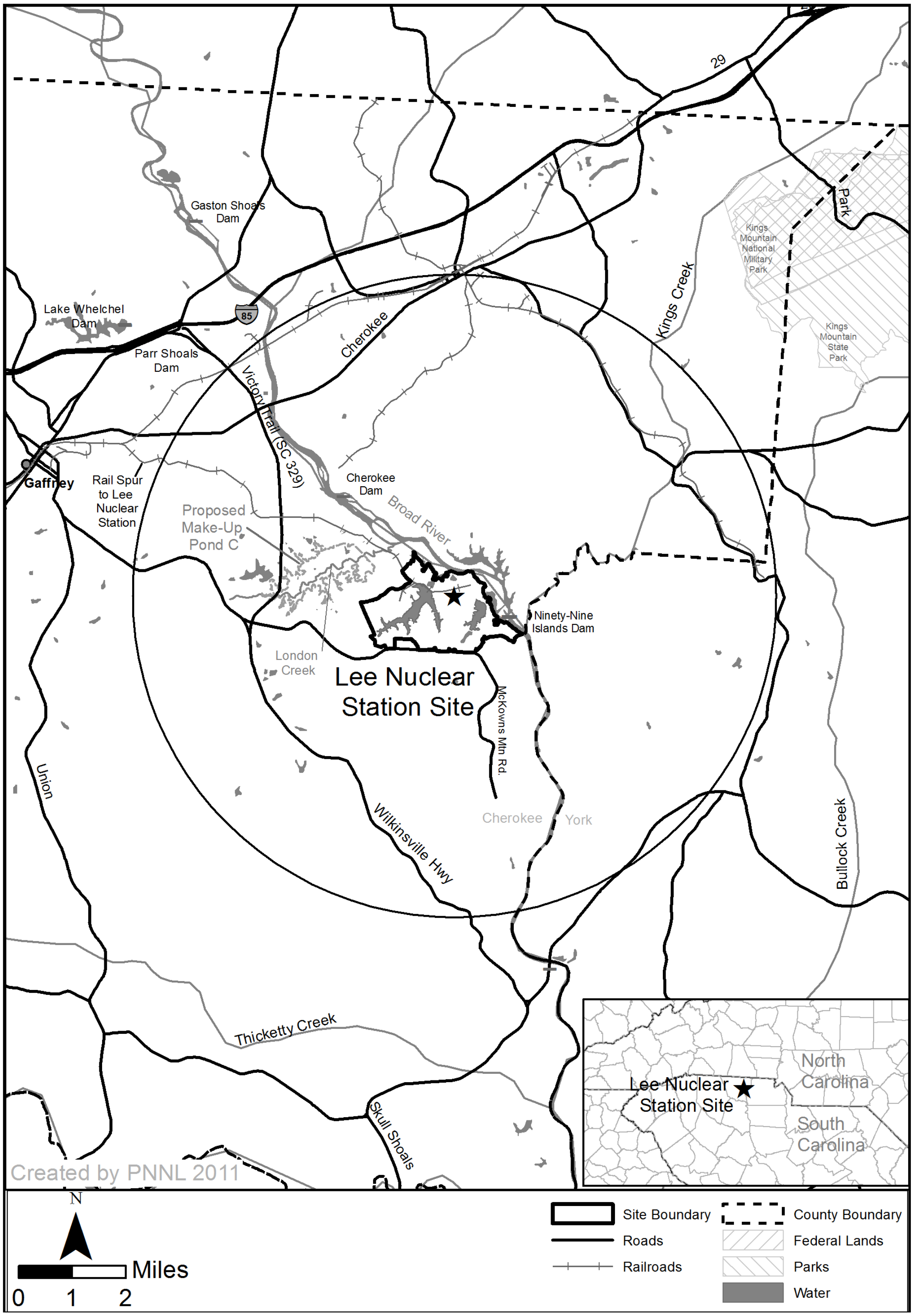

Figure ES-1. Lee Nuclear Station Site

It also evaluates impacts associated with accidents, the fuel cycle, decommissioning, and transportation of radioactive materials.

The impacts are designated as SMALL, MODERATE, or LARGE. The incremental impacts related to the construction and operations activities requiring NRC authorization are described and characterized, as are the cumulative impacts resulting from the proposed action when the effects are added to, or interact with, other past, present, and reasonably foreseeable future effects on the same resources.

SMALL: Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE: Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.

LARGE: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

The review team found that the cumulative environmental impacts on most aspects of water use and quality, most socioeconomic areas (adverse only), environmental justice, nonradiological and radiological health, severe accidents, fuel cycle, decommissioning, and transportation would be SMALL. The cumulative impacts for physical impacts and infrastructure and community services would be SMALL to MODERATE.

The review team found that the cumulative environmental impacts on land use, surface-water use, terrestrial and wetland ecosystems, aquatic ecosystems, air quality, and historic and cultural resources would be MODERATE. The impacts from NRC-authorized activities would be SMALL for all of the above-listed resource areas. The incremental impacts associated with the development of transmission lines and Make-Up Pond C would be the principal contributors to the MODERATE cumulative land-use impacts. Potential future water-supply issues in the Broad River Basin would be the primary driver for the MODERATE impact for surface-water use. Cumulative terrestrial and wetland ecosystem impacts would be MODERATE because of the loss of habitat from development of transmission-line corridors. The development of Make-Up Pond C would have cumulative aquatic ecosystem impacts on London Creek and its tributaries. The MODERATE cumulative impact on air quality would result from the existing concentration of greenhouse gases in the atmosphere. The review team found cumulative impacts from Make-Up Pond C development and transmission-line corridor development would contribute to the MODERATE impact for historic and cultural resources.

The review team found no LARGE, adverse cumulative impacts.

Table ES-1 provides a summary of the cumulative impacts for the proposed site.

Table ES-1. Cumulative Impacts on Environmental Resources, Including the Impacts of Proposed Lee Nuclear Station

Resource Category	Impact Level
Land use	MODERATE
Water-related	
Surface-water use	MODERATE
Groundwater use	SMALL
Surface-water quality	SMALL
Groundwater quality	SMALL
Ecology	
Terrestrial ecosystems	MODERATE
Aquatic ecosystems	MODERATE
Socioeconomic	
Physical impacts	SMALL to MODERATE
Demography	SMALL
Economic impacts on the community	SMALL to LARGE (beneficial)
Infrastructure and community services	SMALL to MODERATE
Aesthetics and recreation	SMALL
Environmental justice	SMALL
Historic and cultural resources	MODERATE
Air quality	MODERATE
Nonradiological health	SMALL
Radiological health	SMALL
Severe accidents	SMALL
Fuel cycle, transportation, and decommissioning	SMALL

Alternatives

The review team considered the environmental impacts associated with alternatives to issuing COLs for Lee Nuclear Station. These alternatives included a no-action alternative (i.e., not issuing the COLs), and alternative energy sources, siting locations, or system designs.

The **no-action alternative** would result in the COLs not being granted or the USACE not issuing its permit. Upon such a denial, construction and operation of the two units at the Lee Nuclear Station site would not occur and the predicted environmental impacts would not take place. If no other facility would be built or strategy implemented to take its place, the benefits of the additional electrical capacity and electricity generation to be provided would also not occur and the need for baseload power would not be met.

Based on the review team's review of **energy alternatives**, the review team concluded that, from an environmental perspective, none of the viable alternatives is clearly environmentally preferable to building a new baseload nuclear power generation plant at the Lee Nuclear Station site. The review team eliminated several energy sources (i.e., wind, solar, and biomass) from full consideration because they are not currently capable of meeting the need of this project. None of the viable baseload alternatives (natural gas, coal, or a combination of alternatives) was environmentally preferable to the proposed nuclear units.

After comparing the cumulative effects of the proposed site against those of the **alternative sites**, the review team concluded that none of the alternative sites would be environmentally preferable to the proposed site for building and operating a new nuclear power plant. The three alternatives sites selected were the following:

- Perkins site (previously considered for the Perkins Nuclear Station), Davie County, North Carolina (Figure ES-2),
- Keowee site (adjacent to Oconee Nuclear Station), Oconee County, South Carolina (Figure ES-3),
- Middleton Shoals site, Anderson County, South Carolina (Figure ES-4).

Table ES-2 provides a summary of the cumulative impacts for the alternative sites. The review team concluded that all of the sites were generally comparable, and it would be difficult to state that one site is preferable to another from an environmental perspective. In such a case, the proposed site prevails because none of the alternatives is clearly environmentally preferable.

The review team considered various **alternative systems designs**, including seven alternative heat-dissipation systems and multiple alternative intake, discharge, and water-supply systems. The review team identified no alternatives that were environmentally preferable to the proposed Lee Nuclear Station plant systems design.

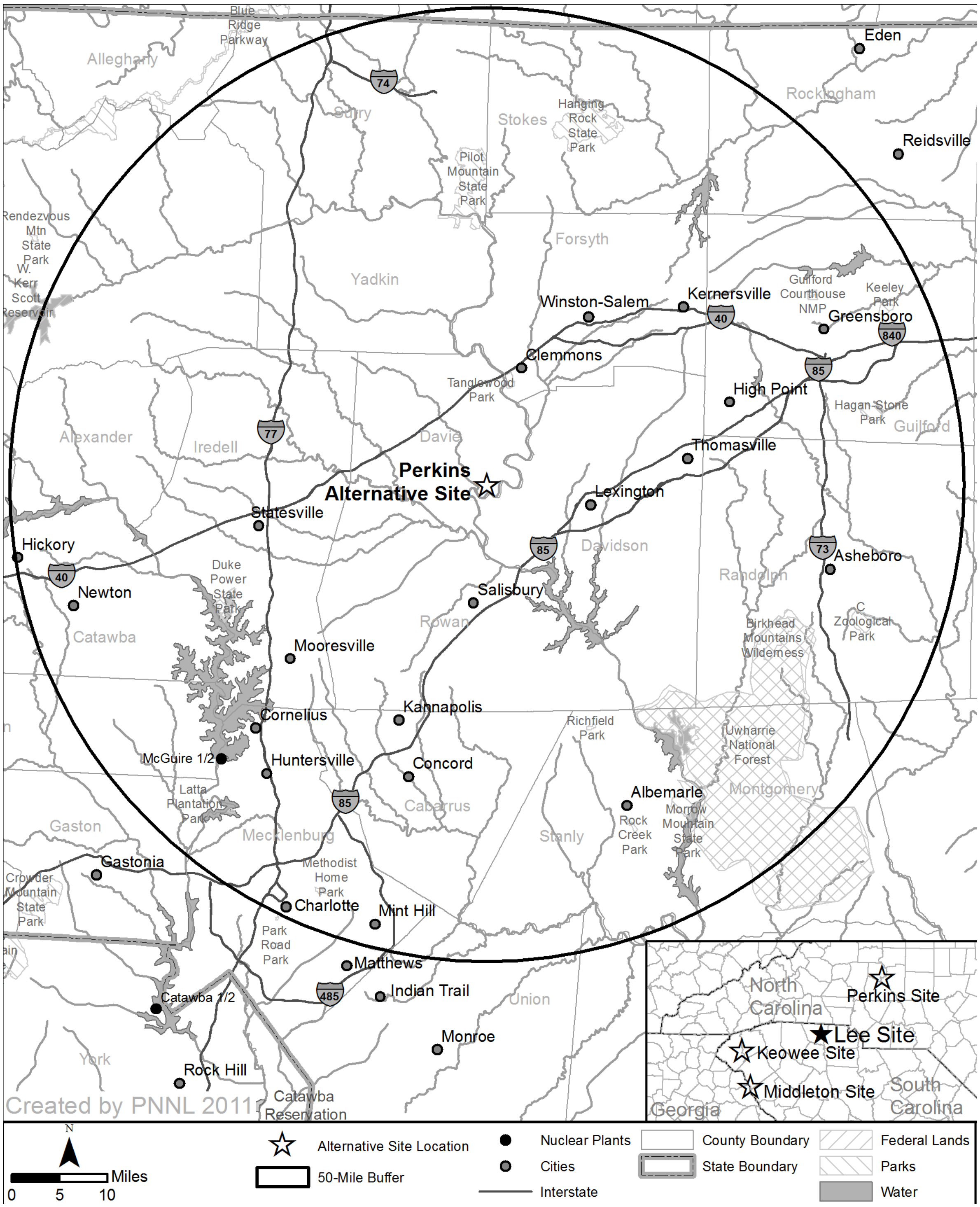

Figure ES-2. Perkins Site

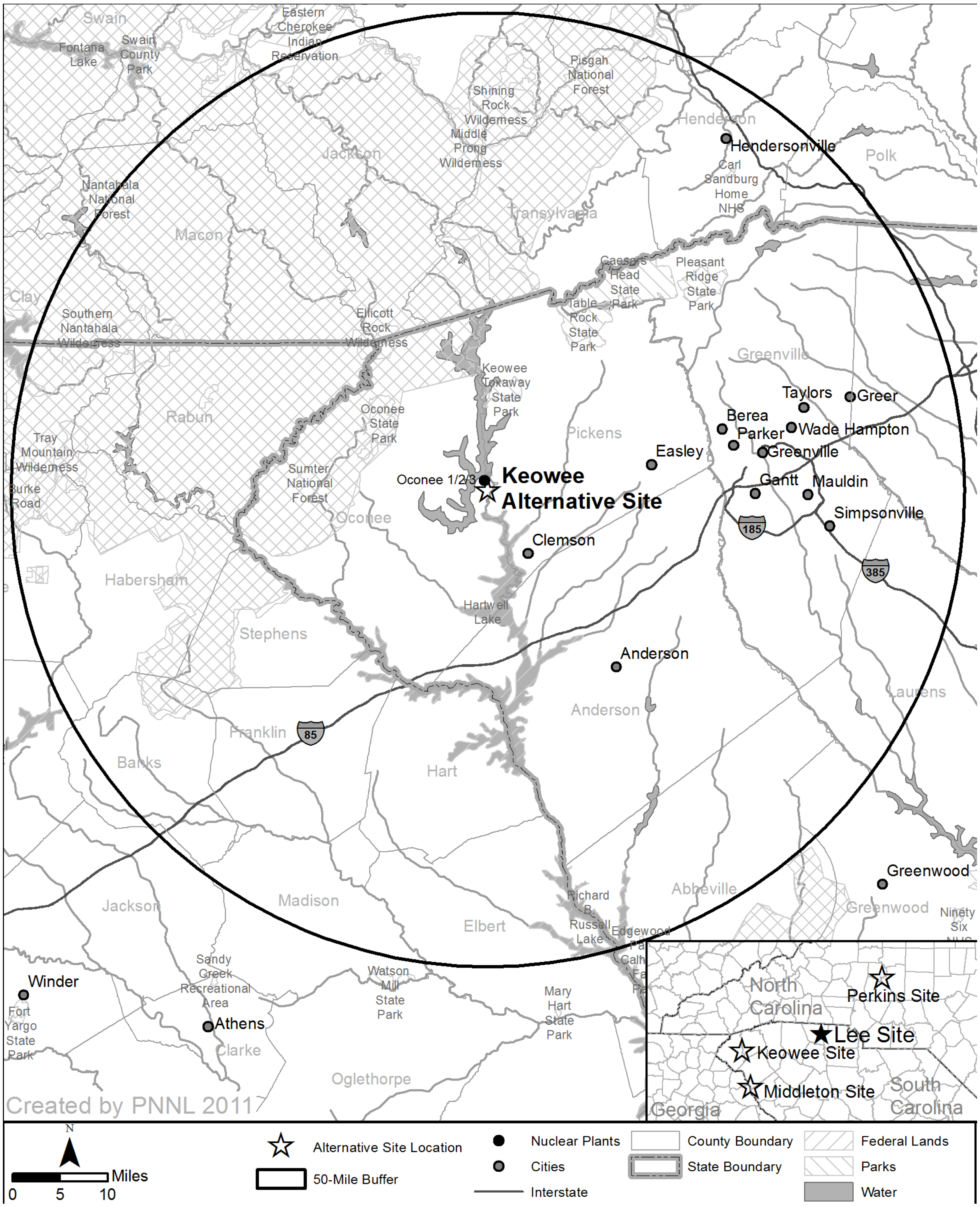

Figure ES-3. Keowee Site

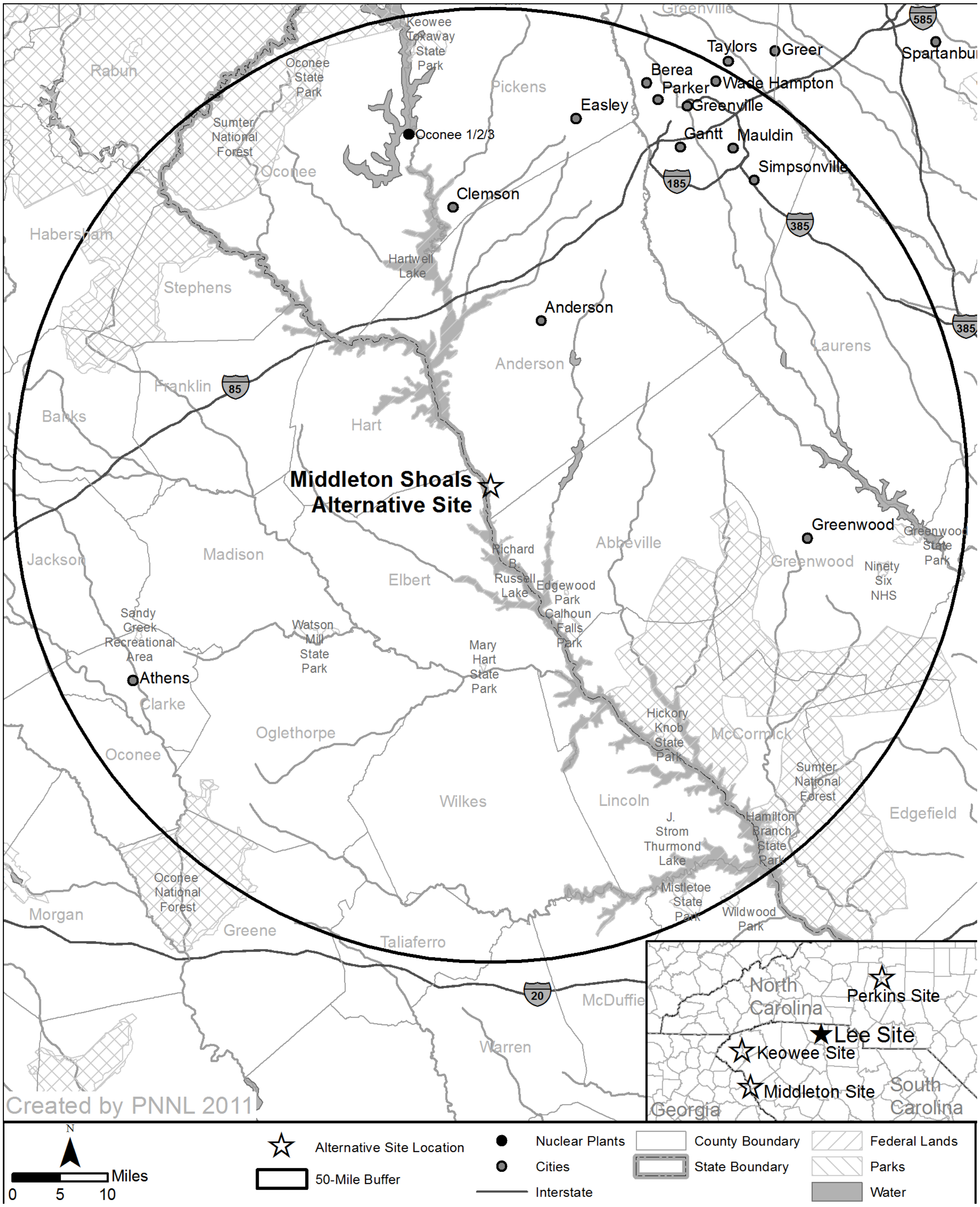

Figure ES-4. Middleton Shoals Site

Benefits and Costs

The review team compiled and compared the pertinent analytical conclusions reached in the EIS. It gathered all of the expected impacts from building and operating the proposed Lee Nuclear Station and aggregated them into two final categories: (1) the expected environmental costs and (2) the expected benefits to be derived from approval of the proposed action. Although the analysis in Section 10.6 is conceptually similar to a purely economic benefit-cost analysis, which determines the net present dollar value of a given project, the intent of the section is to identify potential societal benefits of the proposed activities and compare them to the potential internal (i.e., private) and external (i.e., societal) costs of the proposed activities. In general, the purpose is to inform the COL process by gathering and reviewing information that demonstrates the likelihood that the benefits of the proposed activities outweigh the aggregate costs.

On the basis of the assessments in this EIS, the building and operation of the proposed Lee Nuclear Station, with mitigation measures identified by the review team, would accrue benefits that most likely would outweigh the economic, environmental, and social costs. For the NRC-proposed action (i.e., NRC-authorized construction and operation), the accrued benefits would also outweigh the costs of preconstruction, construction, and operation of the proposed Lee Nuclear Station.

Recommendation

The NRC's recommendation to the Commission related to the environmental aspects of the proposed action is that the COLs should be issued as proposed.

This recommendation is based on the following:

- the application, including the ER and its revisions, submitted by Duke
- consultation with Federal, State, Tribal, and local agencies
- consideration of public comments received during scoping and on the draft EIS
- the review team's independent review and assessment detailed in this EIS.

In making its recommendation, the review team determined that none of the alternative sites is environmentally preferable (and, therefore, also not obviously superior) to the Lee Nuclear Station site. The review team also determined that none of the energy or cooling-system alternatives assessed is environmentally preferable to the proposed action.

The NRC's determination is independent of the USACE's determination of whether the Lee Nuclear Station site is the least environmentally damaging practicable alternative pursuant to Clean Water Act Section 404(b) (1) Guidelines. The USACE will conclude its analysis of both offsite and onsite alternatives in its Record of Decision.

Table ES-2 provides a summary of the EIS-derived cumulative impacts for the proposed site in comparison with the no-action alternative, alternative sites, and energy alternatives.

Table ES-2. Comparison of Environmental Impacts

Resource Areas	Proposed Site[a]	Alternative Sites[b]			Energy Alternatives[c]		
	Lee	Perkins	Keowee	Middleton Shoals	Coal	Natural Gas	Combination
Land Use	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	SMALL to MODERATE	SMALL to MODERATE
Surface Water	MODERATE	MODERATE	MODERATE	MODERATE	SMALL	SMALL	SMALL
Groundwater	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Aquatic Ecosystems	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Terrestrial Ecosystems	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Air Quality	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	MODERATE	SMALL to MODERATE	SMALL to MODERATE
Socioeconomics	MODERATE (adverse) to LARGE (beneficial)	MODERATE (adverse) to LARGE (beneficial)	MODERATE (adverse) to LARGE (beneficial)	MODERATE (adverse) to LARGE (beneficial)	MODERATE (adverse) to LARGE (beneficial)	MODERATE (adverse) to MODERATE (beneficial)	MODERATE (adverse) to MODERATE (beneficial)
Environmental Justice	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Cultural Resources	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE	MODERATE
Human Health	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Waste Management	SMALL	SMALL	SMALL	SMALL	MODERATE	SMALL	SMALL

(a) Cumulative impact determinations taken from Table 7-4 in the EIS.
(b) Cumulative impact determinations taken from Table 9-18 in the EIS.
(c) Impacts taken from Table 9-4 in the EIS. These conclusions for energy alternatives should be compared to NRC-authorized activities reflected in Chapters 4, 5, 6.1, and 6.2.

Abbreviations/Acronyms

7Q10	lowest flow for 7 consecutive days expected to occur once per decade
AADT	annual average daily traffic
ac	acre(s)
ac-ft	acre feet
ACS	American Community Survey
AD	Anno Domini
ADAMS	Agencywide Documents Access and Management System
ALARA	as low as reasonably achievable
AP1000	Advanced Passive 1000 pressurized water reactor
APE	Area of Potential Effect
AQCR	Air Quality Control Region
ARRA	American Recovery and Reinvestment Act of 2009
BACT	Best Available Control Technologies
BC	before Christ
BEA	Bureau of Economic Analysis
BEIR	Biological Effects of Ionizing Radiation
BGEPA	Bald and Golden Eagle Protection Act
BLS	Bureau of Labor Statistics
BMP	best management practice
BOD	biochemical oxygen demand
Bq	becquerel(s)
Btu	British thermal unit(s)
°C	degree(s) Celsius
CAES	compressed air-energy storage
CAIR	Clean Air Interstate Rule
CDC	U.S. Centers for Disease Control and Prevention
CDF	core damage frequency
CESQG	conditionally exempt small quantity generator
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic foot/feet per second
Ci	curie(s)
cm	centimeter(s)
CMC	criterion maximum concentration
CO	carbon monoxide
CO_2	carbon dioxide

COL	combined construction permit and operating license
CORMIX	Cornell Mixing Zone Expert System
CPCN	Certificate of Environmental Compatibility and Public Convenience and Necessity
CSAPR	Cross-State Air Pollution Rule
CWA	Clean Water Act (aka Federal Water Pollution Control Act)
CWS	circulating-water system
d	day(s)
DA	Department of the Army
dB	decibel(s)
dBA	decibel(s) on the A-weighted scale
DBA	design basis accident
DBH	diameter breast high
DCD	Design Control Document
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
D/Q	deposition factor(s); annual normalized total surface concentration rate(s)
DSM	demand-side management
DTA	Devine Tarbell & Associates
Duke	Duke Energy Carolinas, LLC
Duke Energy	Duke Energy Corporation
EAB	exclusion area boundary
EE	energy efficiency
EECBG	Energy Efficiency and Conservation Block Grant
EIA	Energy Information Administration
EIS	environmental impact statement
ELF	extremely low frequency
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EPT	Ephemeroptera-Plecoptera-Trichoptera (Index)
ER	environmental report
ESP	Early Site Permit
ESRP	Environmental Standard Review Plan
°F	degree(s) Fahrenheit
FAA	Federal Aviation Administration
FES	Final Environmental Statement
FEIS	Final Environmental Impact Statement

FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FP&S	Facilities Planning & Siting
fps	foot (feet) per second
FR	*Federal Register*
FSAR	Final Safety Analysis Report
FSER	Final Safety Evaluation Report
ft	foot/feet
ft^2	square foot/feet
ft^3	cubic foot/feet
FWS	U.S. Fish and Wildlife Service
µg	microgram(s)
g	gram(s)
gal	gallon(s)
GC	gas centrifuge
GCRP	U.S. Global Change Research Program
GD	gaseous diffusion
GDNR	Georgia Department of Natural Resources
GEIS	Generic Environmental Impact Statement
GHG	greenhouse gas
GIS	geographic information system
gpd	gallon(s) per day
gpm	gallon(s) per minute
GWh	gigawatt-hours
HAP	hazardous air pollutant
HDPE	high-density polyethylene
HLW	high-level waste
hr	hour(s)
Hz	hertz
HZI	hydraulic zone of influence
I	U.S. Interstate
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
IGCC	integrated gasification combined cycle
in.	inch(es)
INEEL	Idaho National Engineering and Environmental Laboratory
IRP	Integrated Resource Plan
IRWST	in-containment refueling water storage tank

Abbreviations/Acronyms

ISFSI	independent spent fuel storage installation
kg	kilogram(s)
km	kilometer(s)
km^2	square kilometer(s)
km/hr	kilometer(s) per hour
kV	kilovolt(s)
kW	kilowatt(s)
kW(e)	kilowatt(s) electric
kWh	kilowatt-hour(s)
L	liter(s)
LEDPA	least environmentally damaging practicable alternative
LFG	landfill-based gas
LLC	Limited Liability Company
LLW	low-level waste
LOS	level of service
LPZ	low-population zone
LWA	Limited Work Authorization
LWR	light water reactor
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
m^3/s	cubic meter(s) per second
MACCS2	Melcor Accident Consequence Code System Version 1.12
mg	milligram(s)
MEI	maximally exposed individual
Mgd	million gallon(s) per day
mGy	milligray(s)
mi	mile(s)
mi^2	square mile(s)
mL	milliliter(s)
mm	millimeter(s)
MMS	U.S. Department of Interior Minerals Management Service
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MOX	mixed oxides
mpg	mile(s) per gallon
mph	mile(s) per hour
mrad	millirad

mrem	millirem
MSDS	material safety data sheets
MSL	mean sea level
mSv	millisievert(s)
MSW	municipal solid waste
MT	metric ton(nes)
MTU	metric ton(nes) uranium
MW	megawatt(s)
MW(e)	megawatt(s) electric
MWh	megawatt-hour(s)
MW(t)	megawatt(s) thermal
MWd	megawatt-day(s)
MWd/MTU	megawatt-days per metric ton of uranium
NA	not applicable
NAAQS	National Ambient Air Quality Standard
NAGPRA	Native American Graves Protection and Repatriation Act
NC	North Carolina
NCDENR	North Carolina Department of Environment and Natural Resources
NCI	National Cancer Institute
NCRP	National Council on Radiation Protection and Measurements
NCUC	North Carolina Utility Commission
NCWRC	North Carolina Wildlife Resources Commission
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act of 1969, as amended
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NGCC	natural gas combined cycle
NGVD	National Geodetic Vertical Datum
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NSPS	new source performance standard
NSR	new source review

NUREG	U.S. Nuclear Regulatory Commission technical document
NVC	National Vegetation Classification
NWI	National Wetlands Inventory
NWS	National Weather Service
OCS	outer continental shelf
ODCM	Offsite Dose Calculation Manual
OECD	Organization for Economic Cooperation and Development
OSHA	Occupational Safety and Health Administration
pH	measure of acidity or basicity in solution
PIRF	public interest review factor
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter 2.5 microns or less
PNNL	Pacific Northwest National Laboratory
pp.	pages
ppb	part(s) per billion
ppm	part(s) per million
PRA	probabilistic risk assessment
PSCSC	Public Service Commission of South Carolina
PSD	Prevention of Significant Deterioration (Permit)
PUC	public utility commission
PURC	Public Utility Review Committee
PURPA	Public Utility Regulatory Policies Act of 1978
PV	photovoltaic
PWR	pressurized water reactor
PWS	potable water service
rad	radiation absorbed dose
RAI	Request(s) for Additional Information
RCRA	Resource Conservation and Recovery Act of 1976, as amended
REC	renewable energy credit(s)
rem	roentgen equivalent man
REMP	radiological environmental monitoring program
REPS	renewable energy portfolio standard(s)
RFP	request for proposal
RIMS II	Regional Input-Output Modeling System
RM	river mile
ROI	region of interest

ROW	right-of-way
RRS	(SERC's) Reliability Review Subcommittee
RWS	raw water service
Ryr	reactor year
μS/cm	microsievert(s) per centimeter
s or sec	second(s)
SACTI	Seasonal/Annual Cooling Tower Impact (prediction code)
SAMA	severe accident mitigation alternative
SAMDA	severe accident mitigation design alternative
SC	South Carolina
SCBCB	South Carolina Budget and Control Board
SCDAH	South Carolina Department of Archives and History
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SCDOT	South Carolina Department of Transportation
SCDSS	South Carolina Department of Social Services
SCE&G	South Carolina Electric and Gas
SCIAA	South Carolina Institute of Archaeology and Anthropology
SCR	selective catalytic reduction
SDS	sanitary drainage system
SER	Safety Evaluation Report
SERC	Southeastern Electric Reliability Council
SHA	seismic hazard analysis
SHPO	State Historic Preservation Office (or Officer)
SMCL	secondary maximum concentration limits
SO_2	sulfur dioxide
SO_x	oxides of sulfur
SPCCP	Spill prevention, control, and countermeasure plan
SRS	Savannah River Site
Sv	sievert(s)
SWPPP	stormwater pollution prevention plan
SWS	service-water system
T	ton(s)
T&E	threatened and endangered
TDS	total dissolved solids
TEDE	total effective dose equivalent
THPO	Tribal Historic Preservation Officer
TRAGIS	Transportation Routing Analysis Geographic Information System

TSC	technical support center
UF_6	uranium hexafluoride
UMTRI	University of Michigan Transportation Research Institute
UO_2	uranium dioxide
USACE	U.S. Army Corps of Engineers
USC	United States Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
US	U.S. (State Highway)
VACAR	Virginia-Carolinas (subregion)
VCSNS	Virgil C. Summer Nuclear Station
VEGP	Vogtle Electric Generating Plant
VOC	volatile organic compound
WCD	waste confidence decision
Westinghouse	Westinghouse Electric Company, LLC
WWS	wastewater service
χ/Q	atmospheric dispersion factor(s); annual average normalized air concentration value(s)
yd	yard(s)
yd^3	cubic yard(s)
yr	year(s)
yr^{-1}	per year

8.0 Need for Power

Chapter 8 of the U.S. Nuclear Regulatory Commission's (NRC's) Environmental Standard Review Plan (ESRP) (NRC 2000a) guides the NRC staff's review and analysis of the need for power for a proposed nuclear power plant. The guidance states:

> Affected states or regions continue to prepare need-for-power evaluations for proposed energy facilities. The NRC will review the evaluation for the proposed facility and determine if it is (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainty. If the State's or region's need-for-power evaluation is found acceptable, no additional independent review by NRC is needed, and the State's analysis can be the basis for ESRPs 8.2 through 8.4 (NRC 2000a).

In a 2003 response to a petition for rulemaking, the NRC reviewed whether the need for power should be considered in NRC environmental impact statements (EISs) prepared in conjunction with applications that could result in new plant construction (68 FR 55905). The NRC concluded that "…need for power must be addressed in connection with new power plant construction so that the NRC may weigh the likely benefits (e.g., electrical power) against the environmental impacts of constructing and operating a nuclear power reactor." The NRC also stated in its response to the petition discussed above that (1) the NRC does not supplant the States, which have traditionally been responsible for assessing the need for power-generating facilities, for their economic feasibility, and for regulating rates and services; and (2) the NRC has acknowledged the primacy of State regulatory decisions regarding future energy options (68 FR 55905).

As identified in Section 1.3 of this EIS, the purpose and need for the project is to provide for additional baseload electric-generating capacity. The proposed William States Lee III Nuclear Station (Lee Nuclear Station) consists of two Westinghouse Advanced Passive 1000 (AP1000) nuclear power plants providing a combined net electrical output of approximately 2234 MW(e) of baseload-generating capacity. Unit 1 is projected to enter commercial service in 2024, while Unit 2 is projected to enter commercial service in 2026[a] (Duke 2013b). Duke Energy Carolinas, LLC (Duke) would own and operate 100 percent of the plant and its respective power

(a) On October 15, 2013, Duke submitted its 2013 Integrated Resource Plan (IRP) to the North Carolina Utilities Commission (NCUC) and the Public Service Commission of South Carolina (PSCSC). In this document Duke modified the in-service dates for the two units from 2022 and 2024, to 2024 and 2026, and also made some adjustments to its projections for future generation sources including energy efficiency. However, the review team determined that the changes in the updated IRP do not materially change the analysis or the results of that analysis. Therefore, the analysis that follows has not been modified to address the 2013 IRP, which had not yet been reviewed and approved by the NCUC and the PSCSC at the time this final EIS was completed.

capacity. It is also noted that Duke has provided an option to the Jacksonville Electric Authority to purchase up to 20 percent of the proposed Lee Nuclear Station (Duke 2012a). In addition, Duke is performing due diligence to acquire a minority portion of Santee Cooper's 45 percent ownership stake in the V.C. Summer Nuclear Generating Station. As there are no firm commitments to date, the full nuclear portfolio (capacity of the Lee Nuclear Station only) was considered the base case for analysis (Duke 2012a).

The State of South Carolina frames the term baseload plant as a unit or facility "designed to be operated at a capacity factor exceeding 70 percent annually, has a gross initial generation capacity of 350 MW(e) or more, and is intended in whole or in part to serve retail customers of a utility of South Carolina" (South Carolina [SC] Code Ann. 58-33-220). The purpose of the proposed project is consistent with the definition as offered by the State.

Duke is an electric utility as defined by Title 10 of the *Code of Federal Regulations* (CFR) 50.2 and is subject to the regulations of its respective retail regulators and the Federal Energy Regulatory Commission (FERC). Duke's proposed need for power is subject to the regulatory review of both the State of North Carolina through the North Carolina Utilities Commission (NCUC); and the State of South Carolina through the Public Service Commission of South Carolina (PSCSC) through the annual review and evaluation of Duke's Integrated Resource Plan (IRP).

The following sections describe the need for baseload electric-generating capacity. Section 8.1 reviews the current power system and describes the regional characteristics of the Duke service area. Section 8.1 also reviews and discusses the regulatory guidance provided by the States of North Carolina and South Carolina; the determination of the need for power through assessment of the IRP; and concludes with a description of how the need-for-power evaluation performed by the States meets the four required criteria provided by the NRC. Section 8.2 provides a review of pertinent details describing the demand for power, including an assessment of aspects that can impact the demand for power such as regional, State, and Federal policies; energy efficiency (EE) and demand-side management (DSM); and econometric indicators. Section 8.3 discusses the Duke service area power supply, including a review of past, present, and future generating capacity, power purchasing, and policies that may impact supply-side resources. Section 8.4 provides the NRC staff's conclusions regarding the determination of the need for power as proposed by the applicant and verified by the State's evaluation processes.

Where necessary, data and details may be supplemented by information from other independent resources such as State energy offices, regional reliability and power-planning entities (e.g., the Southeastern Electric Reliability Council [SERC], Energy Information Agency [EIA]), and neighboring electric-generating utilities.

8.1 Description of Power System

The following sections describe the Duke service area, the regional reliability of the bulk power-supply system infrastructure related to the North Carolina and South Carolina power system, and the regulatory framework of the States of North Carolina and South Carolina under which the need for power has been evaluated and validated.

8.1.1 Duke Service Area

Duke is one of the largest investor-owned utilities in the United States. It has a rated generating capacity of just over 20,000 MW(e) serving an approximately 22,000 mi^2 area in central and western North Carolina and western South Carolina, with 70 percent of the customer base in North Carolina. In addition to retail sales to over 2.3 million customers across the service area, Duke also sells wholesale electricity to incorporated municipalities and to public and private utilities within the Virginia-Carolinas (VACAR) subregion of the SERC region.

Duke defines the service area as being composed of the geographic region encompassing the franchised service areas in North Carolina and South Carolina, the primary retail customers to be served within that service area, and any reliability-related or wholesale power obligations within that service area (Duke 2009c). As an integrated and regulated electric utility providing service to North Carolina and South Carolina, the primary consideration in the evaluation of installed new power capacity must be meeting the service obligations of current and future customers in the franchised service area. The Duke franchised service area and primary load centers in the North Carolina and South Carolina region are shown in Figure 8-1.

Within the North Carolina and South Carolina franchised service areas, Duke is defined as both an electric supplier and a public utility. Duke is governed by the laws of each State in addition to the rules and regulations of the respective utility commissions. Although the statutory language is somewhat different between the States, both North Carolina and South Carolina require Duke to provide “adequate and reliable” utility service.

The major native load centers within the service area include large municipal areas in North Carolina such as Charlotte, Winston-Salem, and Greensboro. In South Carolina, the territory includes the quickly growing Interstate 85 (I-85) corridor with municipalities of Greenville, Spartanburg, and Anderson continuing to show consistent growth in population and light industry.

The existing Duke customer base as a percentage of sales in gigawatt-hours (GWh) is distributed among the following end users: residential use at 35 percent, commercial (general service) use at 34 percent, industrial use at 25 percent, and wholesale power supply use at 6 percent (Duke 2012b). The historic decline in electrical demand in the industrial base is offset by modest annual growth in both the residential and commercial classes over the same time

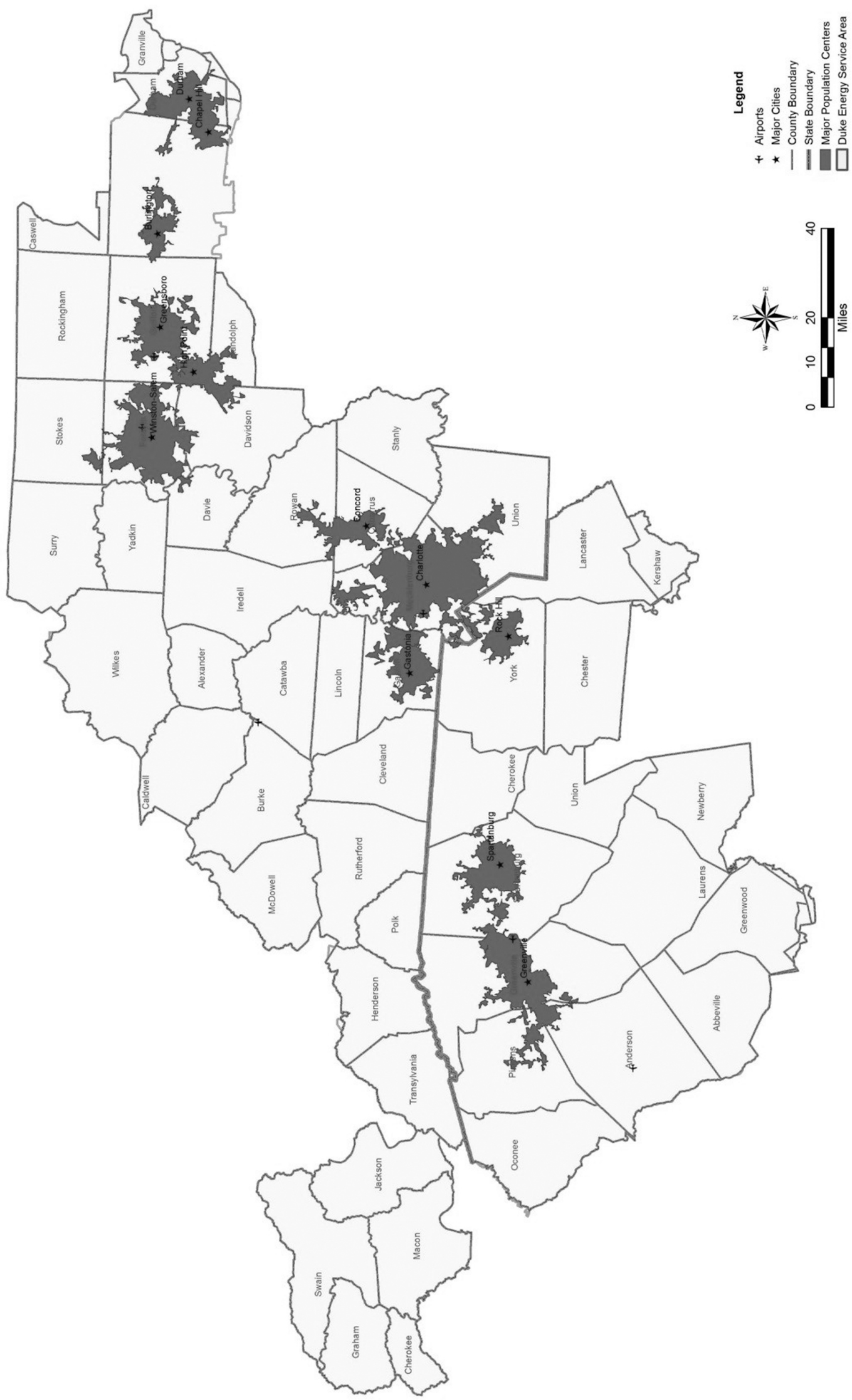

Figure 8-1. Duke Energy Carolinas, LLC Franchised Service Area in North Carolina and South Carolina (Duke 2009c)

period, as well as execution of wholesale power agreements. In year over year analysis, the demand for energy has dropped most recently due to the impacts associated with the economic downturn observed both regionally and nationally. However, retail electricity sales are expected to recover due to steady gains in the regional population and execution of wholesale energy contracts. Accompanied by wholesale power sales obligations, Duke is forecasting a compound annual growth rate for peak demand of 1.7 percent and a growth in energy of 1.6 percent after accounting for EE programs (Duke 2012b).

8.1.2 Regional Reliability and Market Descriptions

Duke generating facilities and transmission systems operate entirely within the VACAR subregion of SERC and are interconnected with both privately owned and State-owned utility systems. SERC serves as a regional entity with delegated authority from the North American Electric Reliability Corporation (NERC) for the purpose of proposing and enforcing reliability standards within the SERC region. In addition, SERC and its various subregions (e.g., VACAR) work to promote and improve the reliability, adequacy, and critical infrastructure of the bulk power-supply systems within the SERC region. Owners, operators, and users of the bulk power-supply system in these states cover the SERC region. The SERC region, as shown in Figure 8-2, is an area of approximately 560,000 mi^2 (SERC 2009).

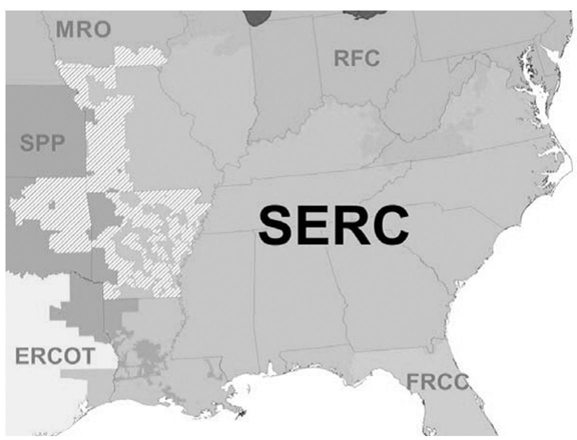

Figure 8-2. The SERC Service Territory (SERC 2009)

As a SERC member, Duke participates in planning, operating, and exchanging information with other SERC members to ensure the continued reliability of interconnected systems and to facilitate periodic reviews of reliability-related activities within the region. The NRC staff found that Duke's annual demand forecasts and electrical growth estimates are consistent with the recent SERC (VACAR) forecasts as compiled in the *Reliability Review Subcommittee's 2012 Annual Report to the SERC Engineering Committee* (SERC 2012). Duke's energy forecast of 1.6 percent annually, which includes retail and wholesale commitments as well as implementation of EE programs, compares reasonably with the VACAR subregion forecast of approximately 1.4 percent annual growth over the next 10 years (SERC 2012). The Duke forecast also asserts that the largest influence on forecasted energy growth is likely based on the impact from EE programs and the significant growth in wholesale energy and power obligations.

Utility commissions in both North Carolina and South Carolina have indicated support for Duke's policy of not relying on generation capacity outside of the service area to meet native baseload requirements, as interruptions in transmission, availability, or capacity may jeopardize the legally binding conditions of the service obligation required of Duke. Further, PSCSC concluded that proposals for purchased power are mandatory only for new peaking generation capacity (PSCSC 2007). The NCUC concluded that policies prohibiting the construction of new baseload generation capacity (e.g., coal and nuclear power plants) may create risks associated with excessive electric rates and unreliable service, and would contravene North Carolina General Statute 62-2(a)(3), requiring reliable and economic utility service to all citizens of the State (NCUC 2006).

Significant non-regulated, uncommitted (merchant) capacity exists in neighboring balancing authority areas with direct interconnection to the Duke service area. This capacity is primarily natural-gas-fired generation. Due to the unknown commitment status of this capacity, transmission access limitations, and physical transmission constraints, the reliable deliverability of this capacity cannot be guaranteed. Therefore, conclusions cannot be drawn regarding the purchase and distribution of merchant capacity within the service territory or in neighboring areas, and the capacity can neither be considered nor modeled as a viable supply of baseload capacity (Duke 2008n). This premise is consistent with a review of non-regulated power capacity within the North Carolina and South Carolina service territories, which indicates a limited amount of total available capacity (EPA 2007c).

8.1.3 Regulatory Framework

Duke is a regulated, investor-owned utility in North Carolina and South Carolina with a designated franchised service area. Duke operates under statutes, regulations, and utility commission rules with a requirement to provide reliable, economical electric service to its customers in both States. As such, Duke is required to either formally report (via the IRP) or provide an annual forecast and resource update to each State utility commission addressing its short- and long-term plans for meeting the capacity and reliability needs of its customers. In North Carolina, the IRP shall be filed biennially with annual updates of forecasts, revisions, and amendments to the biennial report filed each year in which the biennial report is not required (NCUC 2011a). In South Carolina, the IRP must be submitted triennially to the State Energy Office, which, "to the extent practicable, shall evaluate and comment on external environmental and economic consequences of each integrated resource plan." South Carolina utilities are also required to provide annual updates to the IRP, or any time the utility plans to acquire additional generating capacity greater than 12 MW (SC Code Ann 58-37-40). To satisfy both States' jurisdictions and filing requirements, a single plan, or IRP, is filed in both States annually. The need for power assessed in the EIS considered Duke's 2011 IRP, which was filed with the State utility commissions on September 1, 2011. In North Carolina, the IRP was filed under NCUC Docket No. E-100, Sub 128; in South Carolina, it was filed under PSCSC Docket No. 2011-10-E. The 2011 IRP was docketed by the NRC September 15, 2011 (Duke 2011g). The NRC staff also evaluated Duke's 2012 IRP, which was filed September 4, 2012 with the State utility commissions, and docketed by the NRC October 3, 2012 (Duke 2012a).

In North Carolina, the IRP is developed in accordance with NCUC regulations as directed by the State of North Carolina General Statutes 62-2 and 62-110.1. These statutes establish State policy to require regulated utilities such as Duke to perform "energy planning in a manner resulting in the least cost mix of generation and demand reduction measures," and the NCUC to keep "current an analysis of long-range needs for expansion of facilities for the generation of electricity in North Carolina, including probable future growth of the use of electricity, probable needed generation reserves, and the extent, size, mix, and location of generating plants" (Duke 2009c).

In South Carolina, IRPs are filed pursuant to PSCSC orders as directed by the South Carolina Code of Laws Section 58-37-40 requiring "...a plan which contains the demand and energy forecast for at least a 15 year period, contains the suppliers program for meeting the requirements shown in the forecast in an economic and reliable manner." These State-specific laws also require that "for electrical utilities subject to the jurisdiction of the PSCSC, this definition must be interpreted in a manner consistent with the integrated resource planning process adopted by the commission" (SC Code Ann 58-37-40).

8.1.3.1 Integrated Resource Planning Process

Integrated resource planning is built on principles of comprehensive analysis, which involve analyzing the full range of supply-side and demand-side options and assessing them against a common set of planning objectives referencing historical, current, and future projections and policies. Integrated resource planning provides an opportunity for utility planners to address complex issues in a structured, inclusive, and transparent manner. Duke's IRP includes discussion of the current state of the utility including generation; EE and DSM programs; power purchase agreements; 20-year energy and peak forecast and resource need projections; target planning reserve margin; new generation and power purchase agreements; results of the planning process; and near-term actions needed to meet customers energy needs that maintain flexibility if operating environments change (Duke 2012a).

Further, the IRP process provides an opportunity for affected parties—both public and private—to review, understand, and provide additional input to the power-planning process. Provisions require Duke's IRPs to be subject to full disclosure and public review prior to approval by the State utility commissions. In North Carolina, rules governing the IRP annual report allow "…the

Public Staff and any other intervenor to file a report, evaluation, or comments concerning any utility's annual report…" (NCUC 2009a). An evidentiary hearing may be scheduled at the discretion of the NCUC and one or more public hearings must be held.

There are only slight variations to the specific details included in each States' representative IRP. As summarized in Table 8-1, the iterative and comprehensive IRP process provides sufficient detail. The modeling and forecasts are provided as the basis of the IRP and subsequent filings to public utility commissions in North Carolina and South Carolina and the State Energy Office in South Carolina. The public utility commissions retain experts (e.g., PSCSC Office of Regulatory Staff) to assist in reviewing the IRP, developing data requests and reviewing responses, providing testimony and associated reports as needed, and responding to intervention and public requests. In North Carolina, the NCUC, as part of its qualitative and quantitative analysis of the IRP, provides a final order detailing the findings of the commission and offering direction for future IRPs or utility reporting requirements. In South Carolina, though the process of IRP evaluation is similar, neither the PSCSC nor the South Carolina Energy Office executes a formal reporting requirement.

The NCUC and PSCSC can approve the IRP, approve it subject to stated conditions or modifications, approve it in part, reject it in part, reject it in its entirety, or provide an alternative plan.

8.1.3.2 Certificate of Public Convenience and Necessity

A provision in South Carolina State law, the Utility Facility Siting and Environmental Protection Act, requires all persons desiring to construct major utility facilities to obtain a Certificate of Environmental Compatibility and Public Convenience and Necessity (CPCN) from the PSCSC prior to the commencement of any construction activities. This process is governed by SC Code Ann 103-3-1 and 58-33-10 et seq. The proposed project has selected the Lee Nuclear Station site in Cherokee County, South Carolina as its preferred site, and will therefore require a CPCN from the PSCSC prior to construction and operation of the plant.

Pursuant to the Utility Facility Siting and Environmental Protection Act, the PSCSC may not grant a certificate for the construction, operation, and maintenance of a major utility facility, either as proposed or as modified, unless it shall find and determine the basis of the need for the facility; the nature of probable environmental impact; that the impact of the facility upon the environment is justified considering the alternatives; that the facilities serve in the interests of system economy and reliability; that there is reasonable conformance to applicable State and local laws and regulations; and that public convenience and necessity require the construction of the facility (SC Code Ann 58-33-160). The most up-to-date IRP commonly provides the baseline forecast and analysis considered in CPCN hearings when the State is tasked with determining if an applicant has a need for a major utility facility.

Table 8-1. IRP Modeling Process

Develop an econometric-based load forecast.	The IRP must report historic energy data and address at a minimum, the next 15-year demand-side and supply-side forecasts. Forecasting must be weather-normalized and address the jurisdictional area, retail, and wholesale loads; customer classes; and annual load factors. Respective State regulations specify forecasting methodologies and standards for data inputs.
Inventory and account for existing supply-side and demand-side resources as well as assumptions regarding new supply-side and demand-side resources.	The IRP must identify existing resources including power purchases, sales, and exchanges; demand-side programs such as existing EE and DSM programs; cogeneration; standby generation; spinning reserves; pooling or coordination agreements; generation; and transmission. The IRP must address potential new supply-side and demand-side resources and the associated decision-making process including regulations such as renewable portfolio standards or EE policies. The IRP must provide the detail required to objectively evaluate the process for securing long-term new supply-side and demand-side options, and the environmental and economic consequences therein.
Apply screening curves to the supply-side and demand-side options.	Using screening curves, the IRP must determine the most cost-effective supply-side options. The sensitivities must include a reasonable range of energy demand and include low-growth, medium (average)-growth, and high-growth scenarios. Demand-side options (e.g., EE and DSM), are screened based on expected cost, availability, saturation and penetration levels; expected energy savings; and regulatory provisions (e.g., renewable portfolio standards and EE goals).
Identify capacity resource.	Using advanced computer optimization models, expected future load is modeled and screened against cost-effective capacity resources. The results provide potential resource portfolios to test in a detailed analysis.
Provide resource portfolio analysis.	Detailed analysis is performed on the resource portfolios with a variety of sensitivities including fuel and electricity pricing, capital cost, environmental regulations, and load sensitivity.
Identify the optimal portfolios of supply-side and demand-side options.	The modeling process helps identify the best demand-side and supply-side options in terms of cost, EE, reliability, safety, regulatory requirements, risk, and uncertainty.

Source: Duke 2009c

Finally, although Duke selected a South Carolina site for the proposed project and will file for the CPCN through the PSCSC, Duke will also need to satisfy consumer protection aspects found in North Carolina General Statute. Among these are mechanisms enabling Duke to petition the NCUC to consider and determine the need for the facility. As part of the proceedings, Duke must also demonstrate the prudency of rate recovery for the corresponding costs of construction and the reasonableness of project development cost recovery (NC Gen. Statute § 62-110.6(a) and 62-110.7(b)). If approved, the NCUC will offer a final ruling, or order, providing direction for future activities.

Duke has not yet petitioned the State of South Carolina for a CPCN; however, it continues to evaluate the optimal time to file the CPCN in South Carolina (Duke 2012a).

8.1.4 Alignment with NRC NUREG-1555 Criteria

In accordance with the NRC's ESRP, and supplemental guidance (NRC 2000a), the NRC staff reviewed the analytical process and need-for-power evaluation provided in the Duke IRP and performed by the States of North Carolina and South Carolina. Taken in aggregate, the NRC staff found the evaluation process met the four NRC criteria for being (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainty. The following details how the four NRC criteria were met.

Systematic: The NRC staff determined that Duke has a systematic and iterative process for load forecasting, which must be updated and reviewed annually as directed and codified by each respective State. On September 1, 2011, Duke filed the 2011 IRP (Duke 2011g) in North Carolina under NCUC Docket No. E-100, Sub 128 and in South Carolina under PSCSC Docket No. 2011-10-E. On September 4, 2012, Duke filed its 2012 IRP (Duke 2012a) in North Carolina under NCUC Docket No. E-100, Sub 137 and in South Carolina under PSCSC Docket No. 2012-10-E.

Regulatory provisions, as described previously in North Carolina and South Carolina, ensure that on an annual basis, Duke is providing the most up-to-date forecast and expected resource portfolios respective of all known current and forecasted conditions. The load forecasts use power industry best practices and methodological approaches to determine the utilities need for power and the most cost-effective strategies to meet regulatory obligations. For these reasons, the NRC staff determined the State processes for IRP evaluation are sufficiently systematic for the purposes of this analysis.

Comprehensive: Peak power and energy forecasts incorporate key influencing factors such as regional economic and demographic trends, price of electricity, existing and new EE and DSM impacts, and weather. Forecasts are generated for each sector of the economy, and separate forecasts are developed to determine both short- and long-term demand. Power-supply forecasts include a comprehensive evaluation of present- and planned-generating capabilities, as well as present and planned purchases and sales of power within the Duke service territory. All analyses are performed with forecasting and statistical modeling and methodological approaches appropriate for the power industry. Therefore, the NRC staff found the need for power contained in the IRP and evaluated by the NCUC and PSCSC sufficiently comprehensive for the purposes of this analysis.

Subject to Confirmation: The Duke IRP processes, models, and estimations are documented and subject to evidentiary review and comment by the public, utility regulators, associated or impacted interest groups, and industry experts. Further, the NCUC Public Staff (representing electric consumers in North Carolina) and the PSCSC Office of Regulatory Staff (representing the electric consumers in South Carolina), review, investigate, and make appropriate recommendations to the utility commissions with respect to furnished or proposed services of any public utility. The data, information, and testimony provided enabled the NCUC Public Staff to conclude that the 2010 and 2011 IRPs were reasonable and should have full commission approval. The NCUC approved the 2010 IRP on October 26, 2011 (NCUC 2011e) and the 2011 IRP on May 30, 2012 (NCUC 2012).

The PSCSC publicly vetted and heard testimony regarding the 2011 IRP on December 20, 2011 through the allowable ex parte briefing (PSCSC 2011b). The hearing addressed relevant aspects of the IRP (e.g., load forecasting methodology and accuracy, impacts of Federal and local regulations on supply-side and demand-side measures, and generation planning). Therefore, the NRC staff determined the Duke processes are sufficiently subject to confirmation for the purposes of this analysis.

Responsive to Forecasting Uncertainty: Duke tests the validity of its overall forecast by analyzing the impact of alternative load forecasts (high, medium, and low) (Duke 2009c). In addition, uncertainty in the load forecast is quantified by evaluating the resource portfolios against variations in future sensitivities (e.g., fuel and construction costs, load forecasts, environmental laws and regulations, and risk). In doing so, Duke develops multiple resource portfolios that quantify both short-term and long-term cost to customers under varying potential sensitivities, while understanding the fundamental strengths and weaknesses of various supply-side and demand-side configurations. For the reasons discussed here, the NRC staff determined the Duke processes are sufficiently responsive to forecasting uncertainty for the purposes of this analysis.

In aggregate, the Duke IRP and State evaluation processes satisfy the four reliability criteria in the NRC's ESRP and supplemental guidance (NRC 2000a). The comprehensive forecast under State regulatory purview and approval, when coupled with information from the SERC regional forecast, provides a reasonable basis for an independent analysis and confirmation of the applicant's stated need for power, and for inclusion in this EIS. The following sections further characterize the need for power.

8.2 Power Demand

In Section 8.2.1, the demand for power is discussed for Duke as provided by its 2012 IRP and as evaluated in the State processes. In Section 8.2.2, a final analysis of the demand for power is provided including the State-approved reserve planning margin.

8.2.1 Factors Affecting Demand

In its 2012 IRP, Duke forecasts an average growth in summer peak demand of 1.7 percent; the forecast includes the impacts associated with proposed new EE programs provided in the IRP. Concurrently, the utility forecasts that annual territorial energy need is growing at 1.6 percent (Duke 2012a). Retail load growth analysis includes end-use segments classified as residential, commercial or general services, and industrial. Specific to the region and the Duke service area, a key to the decline in total retail load growth over the past 5 years is the consolidation and continued loss of textile-based industries. This loss has been offset by growth in the residential and general service segments where, depending on the year, approximately 22,000 to 35,000 new residential customers were added to the service area and by significant growth in wholesale obligations. Nevertheless, Duke is forecasting the sum of retail and wholesale energy sales to grow at a modest 1.6 percent annually (Duke 2012a).

Several factors influence the historic and future demand for electricity. Duke prepares and provides forecasts that capture key criteria from several broad-based categories: weather; economic, demographic, and technology trends; EE and DSM; and price and rate structure. In addition to these categories, Duke includes capacity as it relates to regional reserve sharing agreements and overall company reserve margin requirements. Taken collectively, energy forecasts are then developed from econometric models that characterize and correlate historical usage in megawatt-hours (MWh) to key variables within each category. As part of the hearing record, direct testimony was submitted by Duke to the NCUC and reviewed by the NCUC Public Staff as part of Docket No. E-100, Sub 137 (NCUC 2012). The NRC staff reviewed the hearing testimony and the NCUC Public Staff's assessment of the IRP, determining that the forecasts were complete, accurate of known and foreseeable conditions, and properly reflected the effect of key variables on electricity demand in the service area. As of September, 2013, the NCUC Public Staff has proposed acceptance of the Duke Energy 2012 IRP as well as provided instructions for future filings (NCUC 2013); the NCUC Order approving the IRP is pending.

8.2.1.1 Weather

Duke is a summer peaking utility. With EE programs incorporated, peak electricity demand between summer and winter can vary up to 800 MW(e) (Duke 2012a). To accommodate this variation, Duke applies weather adjustment factors on a 'per-hour' basis to the forecast model that when applied to the historical seasonal data, produces an estimate similar to actual demand levels, indicating the weather adjustment factors used are a reasonable predictor of near-term future demand. Duke applied these factors against a 20-year median of historic data for the relevant area to develop hourly, monthly, and annual demand forecasts using industry-accepted modeling and verification tools. The accuracy of input variables for each demand forecast were then validated; one such example is the direct comparison of hourly demand forecasts against monthly demand forecasts. The NRC staff reviewed the weather-related analysis of the applicant's IRP and environmental report (ER), and determined it to be reasonable.

8.2.1.2 Economic Trends

One of the principal indicators influencing electrical demand is economic growth. Duke uses both short- and long-term economic forecasts as key indicators of the demand for power. Regional economic projections include variables such as total gross State product in North Carolina and South Carolina for manufacturing and nonmanufacturing sectors, employment trends, and total personal income. Source data are provided by a leading economic forecasting firm (i.e., Economy.com), coupled with direct feedback from end-use segments such as the National Council of Textile Organizations. Final adjustments are made to account for the projected impact of marketing and sales programs targeting these segments which are not necessarily captured within the historical usage data such as the incorporation of Plug-In Hybrid Electric Vehicles into the market or the ban on incandescent lighting (Duke 2012a).

An additional consideration reflected in the forecast is the potential impact(s) from legislative policies that would indirectly impact the price of energy through the regulation of emissions or the required implementation of clean energy technologies. To the extent that these policies could affect consumer behavior, the energy forecast accounts for these measures.

8.2.1.3 Demographic Trends

Electricity demand in the relevant area has predominantly come from growth in residential and commercial customers. Duke estimates that in each of the last 5 years, approximately 22,000 new residential customers have been added to the service area. Population forecasts are obtained directly from county-specific information; collectively, this information is used to derive the total population forecast for the 46 counties that Duke serves. The population forecast is then comparatively assessed against independent reviews such as the 2000 U.S. Census information (USCB 2005), which is estimating growth of 50 percent in North Carolina (1.7 percent annually) and 28 percent in South Carolina (0.9 percent annually) overall by 2030, and SERC regional data, which is estimating growth in power demand of approximately 1.4 percent as discussed in Section 8.1.

8.2.1.4 Energy Efficiency and Demand-Side Management

Duke offers a full suite of residential and non-residential EE and DSM programs. Accordingly, the IRP identifies, quantifies, and embeds existing EE and DSM programs into the current forecast. In compliance with a NCUC requirement, Duke will be allocating 1 percent of annual retail revenue from the sale of electricity on future conservation and demand response programs in addition to programs already implemented (Duke 2012a). Examples include programs providing financial incentives to install energy-efficient equipment and technologies, weatherization, and insulation and implement programs that provide technical assistance and educational materials to assist customers in conserving energy. Duke also offers several DSM programs to its customers to reduce peak electricity demands. The effects of these DSM programs are included in the forecast for net system requirements and summer peak load assessments.

In May 2007, Duke filed a specific *Energy Efficiency Plan* in North Carolina (Duke 2007d - Docket No. E-7, Sub 831) and South Carolina proposing the implementation of up to 1700 MW(e) of energy-reduction programs across the region of interest by 2012. The plan has been vetted through the NCUC and PSCSC hearing processes and has been adjusted to reflect a target baseline goal of up to 1900 MW(e) of energy and peak reduction programs over the next 20 years. The 2012 IRP load forecast includes over 1200 MW(e) of cumulative DSM programs, 1320 MW(e) of new EE programs, and a target of a reduction of up to 9.2 million MWh (Duke 2012a).

8.2.1.5 Regional Sharing and Reserve Margin

As a member of the VACAR subregion of SERC, Duke participates in a reserve sharing agreement. This agreement with other members of VACAR requires Duke to carry a proportional share of reserve capacity equal to 1.5 times the capacity of the largest generating unit. This is currently equal to a reserve capacity of 1700 MW(e) and ensures compliance with SERC reliability standards. In addition to its reserve sharing agreement as a member of VACAR, Duke uses a 15.5 percent target planning reserve margin for long-term planning. The SERC region Duke operates in does not require reserve margins; rather, members rely on respective State utility commission directives regarding maintenance of adequate resources. The NCUC requires utilities to include justification of the reserve margin used for planning purposes; the NCUC has approved Duke's stated reserve margin every year via approval of the IRP. Duke has also presented its 15.5 percent reserve margin and reserve margin justification for planning purposes to the PSCSC each year, either through the IRP or annual update. Most recently, Duke has completed a reserve margin analysis based on the NCUC Public Staff's comments provided to the NCUC regarding the 2010 IRP indicated that Duke had not conducted a comprehensive study to determine the appropriate reserve and capacity margin values in a number of years, and that a full reserve margin analysis should be conducted as soon as practicable with subsequent filings to incorporate the analysis. The NCUC Public Staff further commented that

> "The studies should determine the optimal level of reserves to provide generation reliability that considers, the obligation to serve, the value of electricity, and the effect of outages (unserved load), while minimizing the cost to ratepayers" (NCUC 2011c).

It is noted that even if the comprehensive reserve margin analysis should indicate a lower reserve margin is reasonable for future planning, it is not expected to impact the need for baseload capacity. This was corroborated by the NCUC Public Staff in its investigation of the impacts of incorporating a 14 percent target reserve margin into Duke's reference case; the lower reserve margin resulted only in "largely eliminating the need for a 370 MW(e) of combustion turbine" (NCUC 2011c). Based on the findings of the analysis, Duke found that a target reserve margin of 14 to 16 percent performed well in most sensitivity cases. Carried forward, Duke uses 15.5 percent reserve margin for planning purposes (Duke 2012a).

8.2.2 Demand Forecast

The following is a summary of the electricity demand forecast for Duke, including implemented EE programs. The forecasted cumulative demand is evaluated for 2027, which would represent 3 years of commercial operation of both proposed units referenced to the 2012 IRP. The analysis accounts for all currently known demand-side resources as provided through utility IRPs, as docketed and reviewed by each respective State's utility commission. The following analysis provides the projected demand for capacity. The final demand and supply analysis is provided in Section 8.4.

Based on preceding information and Table 8-2, the NRC staff confirmed that the conclusions are acceptable as reviewed, verified, and approved by each respective State's utility commission, NCUC Public Staff (North Carolina), and PSCSC Office of Regulatory Staff (South Carolina). The demand for electricity, including reserve margin, is forecasted to be 26,416 MW(e) in the timeline of consideration.

Table 8-2. 2027 Demand for Power

	Duke IRP Forecasted Demand (MW(e))
Firm peak demand[a]	22,871
Reserve[b]	3545
Final electricity demand for the service territory	26,416

(a) Firm peak less new EE programs (Duke 2012a).
(b) State-approved operating reserve margin (15.5 percent).

8.3 Power Supply

This section discusses the expected supply of electricity in the Duke service area that would be available 3 years after full operation of both proposed units. In developing the power-supply and capacity forecasts for its respective service area, Duke factored in its present- and planned-generating capabilities, present and planned purchases and sales of power, distributed and self-generation power sources, and demand-side reduction.

8.3.1 Present and Planned Generating Capability

The reliable supply of power is inherent to Duke's legal obligations in North Carolina and South Carolina. Accordingly, each State's public utility commissions annually review the power-demand and power-supply forecasts, as well as supporting documentation that may materially affect the forecasting accuracy and power-supply requirements (i.e., Renewable Energy Portfolio Standards [REPS]). As a power generator, Duke is engaged in the operation of baseload, intermediate, and peaking duty power plants. Duke estimates that of the cumulative 21,044 MW(e) of summertime capacity forecasted in 2013, baseload capacity in the form of nuclear and coal-fired facilities will supply approximately 62 percent of the total capacity required and 84 percent of the energy produced (Duke 2012a). The remainder of the capacity requirements will be met by resources such as intermediate and peaking duty power plants, power purchases, and other power supplies such as hydropower and distributed-generation-type facilities.

By annually reviewing and adjusting capacity resources over a rolling 20-year planning period, Duke is able to account for new capacity, unit retirements, generating capacity up-rates and de-rates, as well as impacts of policy drivers (such as the 2007 State of North Carolina Renewable Energy and Energy Efficiency Portfolio Standard) on the resource mix. From this, multiple resource portfolios are generated and tested against cumulative capacity requirement projections and combinations of forecast sensitivities. The resource portfolios do not specify preference or partiality for capacity type; rather they provide a systematic analysis of a range of potential capacity resources necessary for the development of a balanced and cost-effective resource portfolio.

Duke is currently engaged in several activities that will serve to provide additional capacity within the timeline of consideration. The activities are modeled annually on a rolling 20-year planning horizon enabling the incorporation of the most recent and updated information such as receiving a final ruling from the South Carolina for a CPCN for the addition of new generating capacity. Duke's current activities include the development of new fossil-fired capacity (e.g., Cliffside power plant), the Buck Combined Cycle and Dan River Combined Cycle projects, upgrading of hydro-based power plants (Duke 2012a), and potentially increasing its ownership stake in a regional nuclear station through the purchase of capacity (Duke 2012a). Collectively, all of these activities are subject to jurisdictional review and approval from applicable regulatory bodies (e.g., the State utility commissions and FERC).

Duke engages in the annual review and revision of decision dates for unit retirements. These comprehensive evaluations incorporate unit-specific and system-wide goals pertaining to reliability and cost of operation and are coupled with evaluations measuring the effective implementation of demand-reduction and environmental strategies. Duke is currently proposing to retire over 1000 MW(e) of generating assets and potentially up to 1450 MW(e); however, some older coal-fired units may be converted to natural-gas-fired units (Duke 2012a). These retirements are all fossil-fuel-based facilities consisting primarily of combustion turbines and older coal-fired units.

The 2012 Duke IRP quantifies the need for additional capacity well in excess of the capacity expansions already approved by the State via the CPCN process and well in excess of the capacity of the proposed project. By 2028, which is the timeline of consideration as described in Section 8.2.2, Duke is anticipating a need for 4820 MW(e) to meet the growth in future demand, which includes a 15.5 percent planning reserve margin (Duke 2012a). Of that 4820 MW(e), the proposed project is intended to provide slightly less than 50 percent, with the remainder of capacity needs relying on the timely development of combined-cycle power plants, EE, and renewable energy sources (Duke 2012a).

8.3.2 Present and Planned Purchases and Sales of Power

In addition to the sales and delivery of power to the franchised service territory, Duke is an active participant in the wholesale power market for both the sale and purchase of capacity. Duke maintains wholesale power sales agreements with Rate Schedule 10A customers such as municipalities and universities, electric membership cooperatives, and customers with backstand agreements for capacity. In its 2012 IRP, Duke indicates that it will maintain between 900 and 2100 MW(e) of wholesale power sales contracts over the next 10 years (Duke 2012a).

Duke also satisfies a portion of the resource portfolio by routinely purchasing capacity through power purchase agreements. This has historically included contracted power purchase agreements from conventional non-utility (merchant) units such as natural gas-fired combustion turbines and combined-cycle plants, as well as capacity from renewable energy generators and small cogeneration facilities. In its 2012 IRP, Duke indicated that it had firm wholesale purchase commitments for approximately 300 MW(e) of capacity from such facilities (Duke 2012a). Additional power purchases are expected to include conventional energy supplies for intermediate and peaking capacity. As an example, Duke issued bid requests for up to 800 MW(e), with future bid requests (2013 and beyond) of up to 2000 MW(e) (Duke 2012a) when resource needs were identified in previous planning exercises. The market-based bid responses were compared to Duke self-build options, and evaluated as part of the NCUC's CPCN proceedings regarding the Buck Combined Cycle and Dan River Combined Cycle projects. Though Duke ultimately chose to build rather than purchase the capacity, the formal CPCN process ensured appropriate consideration was afforded the purchased-power options.

Guided by the recently enacted North Carolina REPS plan, Duke has issued several rounds of requests for proposals (RFPs) with expressed intent to increase its renewable energy portfolio. The original 2007 RFP process provided a proposed 1900 MW(e) of capacity from alternative energy sources such as wind, solar, biomass, and other sources. The 2012 IRP indicates that renewable energy sources are expected to contribute 758 MW(e) to summer on-peak capacity requirements over the next 20 years (Duke 2012a).

8.3.3 Distributed and Self-Generation of Power

In support of Federal and State policies, Duke routinely purchases capacity from qualifying facilities as designated by the Public Utility Regulatory Policies Act of 1978. Though these facilities are individually of limited total capacity, taken collectively they provide a useful resource for capacity and are included in the Duke's power supply resource mix and load forecasts. Additional resources include smaller, customer-owned standby generation sources that participate in the customer standby generation program; these are also included in both Duke's power supply resource mix and load forecasts. The capacity from these facilities is reflected in the annual load forecast as purchased capacity or as future renewable resource additions.

8.3.4 Need for Baseload Capacity

In concurrent State-approved IRPs and in CPCN hearing records, the NCUC Public Staff (North Carolina) and PSCSC Office of Regulatory Staff (South Carolina)found adequate evidence that the Duke service area will be reasonably served by a balanced resource portfolio that includes the development and integration of multiple sources of energy including traditional power generation resources such as baseload, intermediate, and peaking power supply; programs targeting the expansion of renewable energy resources; and EE and DSM plans (Duke 2012a). Duke has presented its proposed need for new capacity as part of its annual forecast. As evaluated for the hearing record, the IRP indicates that when tested against a variety of sensitivities and planning scenarios (pricing, environmental, regulatory), growing customer demand will be met by the integrated development of baseload, intermediate, and renewable resources; as well as EE and DSM (Duke 2012a).

The SERC Reliability Review Subcommittee (RRS), which conducts seasonal and annual reliability assessments of the SERC region by reviewing the data and studies submitted by SERC member systems, reported in its 2012 Annual Report that while near-term[a] planning horizons appear to indicate sufficient capacity resources, adequate long-term[b] planning reserves would be dependent on future business decisions, including the utilization of uncommitted generation and construction of new baseload capacity (SERC 2012). The RRS also recognizes that, based on the percentage of planned net capacity additions, utilities are preparing to meet the growth in demand, as well as retirements, with a significant commitment to low-carbon-capacity resources (e.g., natural-gas-fired generation [near term] and nuclear

(a) Represented as years present through 2016 (SERC 2012).
(b) Represented as years 2016 through 2021 (SERC 2012).

[long term]) (SERC 2012). As discussed in Sections 8.1.2 and 8.3.2, the NRC staff confirmed it is not reasonable for Duke to pursue uncommitted capacity to satisfy long-term baseload capacity requirements, and the generating capacity that is available is largely natural-gas-fired generation. Accordingly, the NRC staff finds that the proposed project is consistent with a SERC RRS-recognized baseload-generating alternative.

Additional language supporting the need for baseload capacity in the region is provided in the South Carolina State Regulation of Public Utilities Review Committee's Energy Policy Report, which is a comprehensive accounting of both the current and future energy requirements in South Carolina. Although produced largely in the context of addressing pending Federal energy policies and establishing strategies for a course of action, the report, which was compiled by the Office of Regulatory Staff and included a full public vetting, recognized that South Carolina has a "growing baseload electric need" (PURC 2009).

8.3.5 Supply Forecast

The following is a summary of the forecasted cumulative supply for the Duke service territory. The forecasted cumulative supply is evaluated for 2027, which would represent 3 years of commercial operation of both proposed units referenced to the 2012 IRP. The analysis accounts for all currently known and approved supply-side resources as provided through Duke's IRP.

The NRC staff confirmed the PSCSC and NCUC determination that the cumulative generating capacity as offered in the IRP represented a reasonable baseline for the analysis of the supply of power in the service area. Line 8 of Duke's Summer Projections of Load, Capacity, and Reserves table, indicates that existing capacity in 2027 would be 20,207 MW(e). In consideration of company and State-level objectives, the NRC staff assumes that all renewable energy capacity and DSM would be installed, purchased, or utilized; therefore, the NRC staff assumed the full implementation of renewable energy programs (Line 12), would provide an additional 684 MW(e) of capacity and full implementation of DSM programs (Line 17) would provide an additional 1207 MW(e) of capacity. The NRC staff determined that a total cumulative capacity of 22,098 MW(e) would be available to serve load in 2027 (Duke 2012a). Table 8-3 provides the electricity cumulative supply forecast for the Duke service area through summer of 2027 (Duke 2012a). A final demand and supply analysis is provided in Section 8.4.

Based on the preceding information, the NRC staff forecast that the cumulative equivalent capacity will be approximately 22,098 MW(e) in 2027.

Table 8-3. 2027 Cumulative Supply of Power

	Forecasted Cumulative Supply (MW) in 2027 Including Full DSM Implementation and Renewable Resource Additions
1. Cumulative generating capacity[(a)]	20,207
2. Plus full renewables future additions[(b)]	684
3. Plus full DSM program implementation[(c)]	1207
Total cumulative capacity	22,098

Source: Duke 2012a
(a) Line 8, pg. 93
(b) Line 12, pg. 93
(c) Line 17, pg. 93

8.4 Assessment of the Need for Power

The NRC staff considered the hearing record and ensuing evaluations of the Duke 2010, 2011, and 2012 IRPs, as well as other energy forecasts to develop a conclusion about the need for power. The NCUC issued its final orders approving the 2010 and 2011 IRPs in October 2011 and May 2012, respectively. The orders are the State's indications to Duke that the IRPs are compliant with all applicable regulations and directives and, further, provide an explanation of the proceedings, conclusions, and direction for future IRPs. The NCUC approved Duke's summer reserve margin of 15.5 percent for planning forecasts and its forecast planning methodology, which included sensitivities to load forecasting and forecast uncertainty. Duke demonstrated that significant capacity additions would be required within the stated timeline of the proposed project to maintain the target planning reserve margin. The analysis included projections both with and without fully implemented demand-side programs; in both cases, summer peaking load placed planning reserve margins well below target. Duke further specified and offered as part of the IRP that it intends to make baseload capacity additions a significant contributor to the future need for power (NCUC 2012a).

Utility commissions in North Carolina and South Carolina have supported the identified need for new capacity resources and have formalized that position by determining that it is reasonable for Duke to incur limited project costs to preserve the nuclear generation development option (NCUC 2011d), and PSCSC (2011a). Since 2005, each Duke IRP, or annual update, has included an analysis of the nuclear generation option. Consistent with planning objectives conducted on an annual basis and disclosed to the States, Duke disclosed in their 2012 IRP that they anticipate commercial operation of the first nuclear generating unit in 2022, with the second unit planned to be operational in 2024.

As discussed previously, though the 2013 IRP forecast moved the in-service dates to 2024 and 2026 respectively, review of the forecasted data indicates that this does not materially impact the overall need for power requirement quantified in the following Section 8.4.2.

8.4.1 Other Forecasts for Energy

Outcomes of the forecasting efforts are subject to confirmation by parties external to Duke, such as the NCUC Public Staff, PSCSC Office of Regulatory Staff, State utility commissions, state energy offices, and the SERC RRS. Load forecasts submitted by the utilities operating within SERC are a critical element of the process used to establish the capacity obligations within SERC. Therefore, the load forecast receives considerable scrutiny from the SERC RRS to ensure that it represents a reliable estimate of future peak loads and provides the basis upon which to evaluate future capacity requirements. The RRS annual report captures those forecasts and provides a documented assessment, ensuring that the SERC region is being planned in accordance with the NERC reliability standards and applicable SERC supplements (SERC 2012). The predictive capability of Duke's load forecast has compared favorably to historic forecasts and analyses of the VACAR subregion found in RRS annual reports to the SERC's engineering committee.

8.4.2 NRC Conclusions

The NRC staff reviewed the Duke 2010, 2011, and 2012 IRPs; the evaluation conducted by the State of North Carolina via the NCUC Public Staff and the State of South Carolina via the PSCSC Office of Regulatory Staff; and the need for power contained therein within the context of the guidelines in the NRC's ESRP and supplemental guidance (NRC 2000a) as detailed in Section 8.1.4. The NRC staff determined that Duke submitted a comprehensive power-supply and demand forecast to the NCUC and PSCSC that contained a detailed review of the need for power in the Duke service area of North Carolina and South Carolina and effective surrounding geography. Where applicable, supporting details from the NERC, SERC, and the VACAR subregion were used to validate the findings of the States. The NRC staff concluded that the States evaluation of Duke's future load demand and Duke's accuracy in historical load forecasting was a reasonable basis for planning. The NRC staff also verified that Duke's IRPs are (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainty.

Duke has indicated that to maintain its regulatory responsibilities, future capacity additions must include significant contributions from all types of supply-side and demand-side resources. The IRP incorporates planned capacity additions representing baseload, intermediate, and peaking duty technologies, in addition to significant contributions from renewable resources, DSM, and EE programs. While a significant percentage of the need for power will be satisfied by the full implementation of DSM and new renewable energy resources, it is reasonable to conclude that the remainder of the capacity requirements must be met by new generating capacity. Table 8-4 provides the NRC staff's final analysis of the cumulative need for power.

Table 8-4. Final Analysis of the Cumulative Need for Power in 2027

	Cumulative Need for Power MW(e)
Cumulative demand including reserve margin	26,416
Cumulative supply including full DSM and renewables	22,098
Total new capacity required	4318

The NRC staff determined that the cumulative need for power is 4318 MW(e) in 2027. In consideration of the States' evaluation, approval, and determination of the need for power for Duke, the NRC staff accepts as complete and adequate the need-for-power evaluation contained in States' evaluation of the IRP.

9.0 Environmental Impacts of Alternatives

This chapter describes alternatives to the proposed U.S. Nuclear Regulatory Commission (NRC) action for combined licenses (COLs) and the U.S. Army Corps of Engineers' (USACE's) action for a Department of the Army individual permit and discusses the environmental impacts of those alternatives. Section 9.1 discusses the no-action alternative. Section 9.2 addresses alternative energy sources. Section 9.3 reviews the region of interest (ROI) evaluated in the site-selection process, the Duke Energy Carolinas, LLC (Duke) site-selection process, details specific to each one of the respective alternative sites, and summarizes and compares the cumulative environmental impacts for the proposed and alternative sites. Section 9.4 examines plant design alternatives. Section 9.5 presents the USACE's evaluation of onsite alternatives and alternative sites.

The need to compare the proposed action with alternatives arises from the requirement in Section 102(2)(c)(iii) of the National Environmental Policy Act of 1969, as amended (NEPA) (42 U.S.C. 4321) that environmental impact statements (EISs) include an analysis of alternatives to the proposed action. The NRC implements this requirement through its regulations in Title 10 of the *Code of Federal Regulations* (CFR) Part 51 and its Environmental Standard Review Plan (ESRP) (NRC 2000a). The environmental impacts of the alternatives are evaluated using the NRC's three-level standard of significance – SMALL, MODERATE, or LARGE – developed using Council on Environmental Quality (CEQ) guidelines (40 CFR 1508.27) and set forth in the footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B. The issues evaluated in this chapter are the same as those addressed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), Revision 1 (NRC 2013a). Although the GEIS was developed for license renewal, it also provides useful information for the review of new reactors, and is referenced where appropriate throughout this chapter. Additional guidance on conducting environmental reviews is provided in the Staff Memorandum on "Addressing Construction and Preconstruction, Greenhouse Gas Issues, General Conformity Determinations, Environmental Justice, Need for Power, Cumulative Impact Analysis, and Cultural/Historical Resources Analysis Issues in Environmental Impact Statements" (Revision 1) (NRC 2011a).

As part of the evaluation of permit applications subject to Section 404 of the Clean Water Act, the USACE is required by regulation to apply the criteria set forth in the U.S. Environmental Protection Agency's (EPA's) 404(b)(1) guidelines (40 CFR Part 230; hereafter referred to as the 404 Guidelines). These guidelines establish criteria that must be met for the proposed activities to be permitted pursuant to Section 404, which governs disposal sites for dredged or fill material. Specifically, the 404 Guidelines state, in part, that no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge that would have less adverse impacts on the aquatic ecosystem provided the alternative does not have other significant adverse consequences. An area not presently owned by the applicant that could reasonably be obtained, used, expanded, or managed to fulfill the basic purpose of the proposed activity may be considered if it is otherwise a practicable alternative.

9.1 No-Action Alternative

For purposes of an application for COLs, the no-action alternative refers to a scenario in which the NRC would deny the COLs requested by Duke. The USACE could also take no action, or deny the applicant's request for a Department of the Army permit. Upon such a denial by the NRC, the construction and operation of two new nuclear units at the William States Lee III Nuclear Station (Lee Nuclear Station) site in accordance with 10 CFR Part 52 would not occur and the predicted environmental impacts associated with the project would not occur. Preconstruction impacts without a nexus to nuclear safety issues regulated by the NRC, as defined in 10 CFR 50.10(a) and 51.4, may still occur, and environmental impacts resulting from preconstruction activities could still result, even if the NRC denies the COLs requested by Duke. However, no activities, including preconstruction activities, involving discharge of dredged or fill materials into waters of the United States, could occur without a Department of the Army permit from the USACE.

The no-action alternative would result in the proposed nuclear units not being constructed or operated. If no other comparable energy-generation facility (or facilities) was built or strategy implemented to take its place, the benefits of the additional electrical capacity and electricity generation provided by the proposed project would not occur. If no additional conservation measures were enacted to decrease the demand for electrical capacity in Duke's service territory, then the need for baseload power, discussed in Chapter 8, would not be met. Therefore, the purpose and need for this project would not be satisfied by the no-action alternative.

If other generating sources were built, either at another site or using a different energy source, environmental impacts associated with these other sites or energy sources would result. As discussed in Chapter 8, there is a demonstrated need for power and Duke has regulatory responsibilities in North Carolina and South Carolina to provide electrical service in its service area. This needed power may be provided and supported through a number of alternatives that are discussed in Sections 9.2 and 9.3. Therefore, this section does not include a discussion of alternative energy sources (discussed in Section 9.2) or alternative sites (discussed in Section 9.3) that could meet the need for power.

9.2 Energy Alternatives

The purpose and need for the proposed NRC action (i.e., issuance of COLs) identified in Section 1.3.1 of this EIS is to provide additional baseload electric generating capacity within the

Duke service territory by 2024 and 2026[(a)] (Duke 2013b). This section examines the potential environmental impacts associated with energy management or generation alternatives to construction and operation of a new baseload nuclear generating facility (whether at the Lee Nuclear Station site or elsewhere). Section 9.2.1 discusses energy alternatives not requiring new generating capacity. Section 9.2.2 discusses energy alternatives requiring new generating capacity. Other energy alternatives are discussed in Section 9.2.3. A combination of energy alternatives is discussed in Section 9.2.4. Section 9.2.5 compares the environmental impacts from new nuclear, coal-fired, and natural-gas-fired generating units at the Lee Nuclear Station site. Additionally, Section 9.2.5 considers a combination of energy alternatives located at the Lee Nuclear Station site or within close proximity to the Duke service territory.

For analysis of energy alternatives, Duke assumed a bounding target value of 2200 megawatts electric (MW[e]) of electrical output, which is the approximate equivalent electrical capacity of the proposed Lee Nuclear Station project. The review team also used this level of output in its analysis of energy alternatives.

9.2.1 Alternatives Not Requiring New Generating Capacity

The following are three alternatives to the proposed action that do not require Duke to construct new generating capacity:

- purchase the needed electric power from other suppliers
- extend the operating life of existing power plants or reactivate retired power plants
- implement energy efficiency (EE) or demand-side management (DSM) programs.

These alternatives are reviewed in the following sections.

9.2.1.1 Purchased Power

Power to replace the capacity of the proposed new nuclear units would have to be purchased from other generating resources. Under the purchased power alternative, the environmental impacts of power production would still occur but would likely be located elsewhere within the Southeastern Electric Reliability Council (SERC) region, or in neighboring regions with direct bulk transmission capability into the SERC.

The option to purchase power implies that there is adequate generating capacity available for firm sales and transmission into or within the service territory, and Duke regularly reviews

(a) On October 15, 2013, Duke Energy Carolinas submitted its 2013 Integrated Resource Plan (IRP) to the North Carolina Utilities Commission. In this document Duke modified the in-service dates for the two units to 2024 and 2026 and adjusted its projections for future generation sources. Because the review team determined that the changes in the updated IRP do not materially change the analysis or its results, the analysis that follows has not been modified to address the 2013 IRP.

purchased power supply options. Duke reported most recently that it had entered into purchased power arrangements for over 2000 MW(e) over the past 10 years (Duke 2012a).

Utility commissions in both North Carolina and South Carolina have commented on the potential ramifications of requiring capacity purchases. While additional regional capacity may be available to serve native loads from merchant power plants or other similar generators, the capacity from these plants is not generally considered to be useful in supplying baseload capacity. This premise was confirmed by Public Service Commission of South Carolina (PSCSC) Order 2007-626, which indicated that the risk to low-cost, reliable electricity increased in magnitude as mandatory requests for proposals (RFPs) were applied to peaking, intermediate, and ultimately baseload capacity requirements. The Order further concluded that testing the market via RFPs would only be mandatory for new peaking capacity needs (PSCSC 2007). The North Carolina Utility Commission (NCUC), in its order approving the Duke 2005 Integrated Resource Plan (IRP) (NCUC 2006) indicated that,

> During periods of peak consumption, the state's utilities might have to pay extremely high rates to purchase power from other utilities; in some cases they may be unable to import sufficient power at all because of the limitations of the transmission system or for other reasons.

The review team recognizes that the Lee Nuclear Station site is in South Carolina. However, the review team also recognizes the proximity of the site to North Carolina and the fact that the site lies within one contiguous Duke service area, of which the highest percentage of delivered power is used in North Carolina.

Finally, under the Public Utility Regulatory Policies Act of 1978 (PURPA), electric utilities can offer the purchase of electrical energy from qualifying facilities. Due to the limited number and limited total available capacity of PURPA-qualifying facilities in the area, they do not represent a long-term solution for additional baseload capacity in the Duke service territory.

Based on the preceding discussion and the information in Section 8.3.2, which details the Duke power purchasing strategy, the review team concludes that purchasing power is not a reasonable alternative to providing new additional baseload capacity commensurate with the proposed project.

9.2.1.2 Extending the Service Life of Existing Plants or Reactivating Retired Plants

Nuclear power stations are initially licensed by the NRC for a period of 40 years. An operating license can be renewed for up to 20 years, and NRC regulations permit additional license renewals. The NRC performs detailed safety and environmental reviews that comply with the Atomic Energy Act and NEPA prior to each renewal. Duke operates three nuclear power stations in the service area: Catawba Nuclear Station Units 1 and 2 and Oconee Nuclear

Station Units 1, 2, and 3 in South Carolina, and McGuire Nuclear Station Units 1 and 2 in North Carolina. The operating licenses for all three nuclear power stations have been renewed: Oconee Nuclear Station Units 1, 2, and 3 in May 2000 and McGuire Nuclear Station Units 1 and 2 and Catawba Nuclear Station Units 1 and 2 in December 2003 (NRC 2012a). The environmental impacts of continued operation of a nuclear power plant are substantially less than those of developing a new plant. Though existing nuclear stations can receive power uprate licenses from the NRC, the largest capacity increase that the NRC has approved has been 20 percent (NRC 2003).

Fossil fuel-fired power plants slated for extensive refurbishment or reactivation, predominately fossil-fired power plants, generally have economic difficulty meeting the current, more restrictive environmental standards established under the Clean Air Act and Clean Water Act. There are a significant number of planned generating unit retirements within the proposed time frame of the Lee Nuclear Station construction schedule. Several of the retirements are contingent upon the availability of newer generating assets such as the proposed new 825-MW(e) clean-coal Unit 6 at the Cliffside Steam Station in North Carolina. Additionally, Duke indicates that it has included over 2000 MW(e) of conventional coal and combustion turbines on the planned unit retirement list that might be considered for refurbishment. These units lack scrubbing equipment used to remove sulfur emissions or face other environmental regulatory restrictions that would require increased control, accelerating the retirement of 890 MW(e) by 2015 (Duke 2012a). The reactivation of any fossil-fired facility would be bound by the impacts described for the coal and natural-gas-fired alternatives in Section 9.2.2, and would have to comply with the most recent environmental restrictions. As neither coal nor natural-gas-fired alternatives are found to be environmentally preferable to the proposed action, the review team concludes that refurbishment or reactivation of fossil-fired facilities is not a reasonable alternative to proposed action.

Duke owns and operates over 1000 MW(e) of hydroelectric generating facilities within the service territory in addition to significant pumped-storage capacity (Duke 2012a). Licensing and relicensing activities are conducted pursuant to the Federal Power Act and administrated by the Federal Energy Regulatory Commission (FERC). Though uprating capacity is possible, continued operation of existing hydroelectric generation facilities does not necessarily result in providing additional generation capacity. A significant percentage of Duke's hydroelectric capacity is currently operating under the FERC Notice of Authorization for Continued Project Operation for Project No. 2232-522 (73 FR 55505). This process enables the licensee (Duke), to continue uninterrupted hydroelectric operations in accordance with the terms and conditions of the previous license, until the FERC acts on the subsequent application for continued operations, or provides orders directing future activities. While the eventual relicensing of the affected facilities may serve to allow the continued operations of existing capacity, it is not expected to increase capacity. Further, if the project is not relicensed, the loss of capacity would increase the need for power as described in Section 8.4. Discussion of additional hydroelectric capacity is provided in Section 9.2.3.4.

Based on the above discussion, the review team concludes that extending the operating life of existing power plants and reactivating or refurbishing retired plants would not provide additional baseload capacity commensurate with the proposed project and therefore is not a reasonable alternative to the proposed project.

9.2.1.3 Energy Conservation

The aggressive implementation of EE programs is effective in reducing total energy requirements, while DSM programs are effective in reducing peaking and intermediate generation capacity requirements. This is reiterated by North Carolina's Senate Bill 3, which specifically defines DSM as "activities, programs or initiatives undertaken…to shift the timing of electric use from peak to nonpeak demand periods" and EE measures as "an equipment, physical or program change that results in less energy used to perform the same function" (NCUC 2010c).

Duke currently uses comprehensive EE and DSM programs to reduce peak electricity demands and daily power consumption. As reviewed in Section 8.2.1, Duke has proposed to collectively account for almost 2400 MW(e) of EE and DSM out to 2032. Current energy forecasts and load growth projections fully account for the EE and DSM programs, which have been reported as part of the 2012 IRP forecasting process. The programs were vetted through the public hearing process with the NCUC issuing a final settlement agreement approving the program (NCUC 2010d) and the PSCSC via Order No. 2010-79 (PSCSC 2010c). The proposed EE and DSM programs represent a significant reduction in demand for both energy and peak power. However, because the current forecast already accounts for their implementation, and because Duke still demonstrates a significant need for power as described in Section 8.4, they do not represent a substitute for the additional capacity that Duke is seeking through the proposed project. Therefore, EE and DSM programs are not a reasonable alternative to the proposed project.

9.2.1.4 Conclusions

Based on the preceding considerations, the review team concludes that purchasing electric power from other suppliers, reactivating retired power plants, extending the operating life of existing power plants, and full implementation of additional EE and DSM programs are not reasonable alternatives to providing new baseload power generation capacity to meet the long-term requirements in the service territory.

9.2.2 Alternatives Requiring New Generating Capacity

This section discusses the environmental impacts of energy alternatives to the proposed action that would require the applicant to build new generating capacity. In keeping with the NRC staff's evaluation of alternatives to renewal of operating licenses, a reasonable set of energy alternatives to the building and operation of one or more new nuclear units at the Lee Nuclear Station site should be limited to analysis of those power-generation technologies that are technically reasonable and commercially viable, and capable of supplying an equivalent amount of power at a capacity factor similar to a nuclear power plant (NRC 2013a). The discussion in this section is bounded by the individual power generating alternatives that are considered reasonable and viable as baseload technologies. As described in Chapter 8, baseload designed power in the State of South Carolina is defined as being capable of operating at a capacity factor greater than 70 percent, and exceeding 350 MW(e) (SC Code Ann. 58-33-220). The current mix of power-generation options within the SERC is also an indicator of the feasible choices for power-generation technology; approximately 77 percent of the current fleet within the SERC region is fossil-fired generation, followed by nuclear at 14 percent, hydro (including pumped storage) at 8 percent, with the remainder at approximately 1 percent (SERC 2013).

Each year, the Energy Information Administration (EIA), a component of the U.S. Department of Energy (DOE), issues an annual energy outlook. In the *Annual Energy Outlook 2011* (DOE/EIA 2011), the EIA reference case projects that between 2010 and 2035, natural-gas-fired capacity would account for approximately 60 percent of new capacity additions; renewable energy sources would account for approximately 25 percent of new capacity additions; coal-fired capacity would account for approximately 11 percent of new capacity additions; and new nuclear plants would account for approximately 3 percent of new capacity additions (DOE/EIA 2011).

The review team recognizes that proponents of all of these generating resources are continually working to develop improved technologies that are more cost efficient and result in fewer environmental impacts, and the impacts discussed below are estimates based on present technologies. However, the discussion in Sections 9.2.2.1 and 9.2.2.2 is limited to the individual alternatives that appear to the review team to be viable baseload generation sources of a commensurate level of power as the proposed project: coal-fired and natural-gas combined-cycle-fired generation. The discussion in Section 9.2.3 addresses alternative generation technologies that have demonstrated commercial acceptance but may be limited in application, total capacity, technical feasibility, or geographic restrictions when compared to the need to supply reliable, baseload capacity.

The review team assumed new generation capacity would be located at the Lee Nuclear Station site for the coal-fired and natural-gas-fired alternatives, and mechanical draft cooling towers would be used. For completeness, the electric power transmission-line rights-of-way from these alternatives were assumed to follow the same rights-of-way proposed for nuclear generation on the Lee Nuclear Station site. These rights-of-way, as previously discussed, would be developed to tie in to the 230-kV Pacolet Tie-Catawba transmission line approximately 7 mi south of the Lee Nuclear Station site, and the 525-kV Oconee-Newport transmission line approximately 15 mi south of the site.

9.2.2.1 Coal-Fired Power Generation

For the coal-fired generation alternative, the review team assumed building and operation of four pulverized coal-fired units, each with a net capacity of 530 MW(e) at the Lee Nuclear Station site for a gross capacity of 2120 MW(e). The review team also assumed the acquisition and use of the same transmission-line rights-of-way, discussed for the proposed Lee Nuclear Station in Section 3.2.2.3, as well as development and operation of Make-Up Pond C, which would be required based on using the same electrical generating technology as the proposed project (condensing steam turbine). The new coal-fired generation is assumed to have an operating life of 40 years (the same operating life as allowed initially for a nuclear plant under a COL, even though that number has no regulatory applicability to non-nuclear power plants).

The review team also considered integrated gasification combined-cycle (IGCC) coal-fired power plants as a baseload-capable technology. IGCC is an emerging technology for generating electricity with coal that combines modern coal gasification technology with combustion-turbine and steam-turbine power generation. This technology is considered to be cleaner than conventional pulverized coal plants because major pollutants can be removed from the gas stream before combustion. The IGCC alternative also generates less solid waste than the pulverized coal-fired alternative. The largest solid-waste stream produced by IGCC installations is slag, a black, glassy, sand-like material that is a marketable byproduct. The other large-volume byproduct produced by IGCC plants is sulfur, which is extracted during the gasification process and can be marketed rather than placed in a landfill. IGCC plants do not produce ash or scrubber wastes. Duke Energy Indiana received regulatory approval to construct a 630-grossMW(e) power station at the existing Edwardsport site in Indiana. The Edwardsport project has the advantage of local, State, and Federal incentives totaling $460 million (Duke Energy 2011b).

Although IGCC has the advantages noted above, the review team concludes that, at present, IGCC is not a reasonable alternative to a 2200-MW(e) nuclear power-generation facility for the following reasons: (1) IGCC plants are more expensive than comparable pulverized coal plants; (2) the system availability of existing IGCC plants has been lower than pulverized coal plants (NETL 2007); (3) and refined engineering has indicated that non-carbon emissions and plant efficiency would not be significantly better than supercritical steam electric plants (NPCC 2010). For these reasons, IGCC plants are not considered further in this EIS.

Air Quality

The review team assumed a plant design that would minimize air emissions through a combination of boiler technology and post-combustion pollutant removal. Emission estimates are based on "as-fired" and controlled conditions and are not representative of what would likely be permitted. Final permitting to operate the plant would require applicable Best Available Control Technologies (BACT) as part of the new source review requirements under Title 1 of the Clean Air Act. Impacts on air quality from coal-fired generation would vary considerably from those of nuclear generation because of emissions of criteria pollutants from sulfur dioxide, nitrogen oxides, carbon monoxide, particulate matter, and hazardous air pollutants such as mercury.

Duke (2009c) provided the following emissions estimates for the coal-fired alternative for sulfur dioxide (SO_2), nitrogen oxides (NO_x, including NO and NO_2), carbon monoxide (CO), and total particulate matter (PM), with the review team concluding that the estimates were reasonable for the technology and controls selected:

- SO_2 – 7814 T/yr
- NO_x – 1658 T/yr
- CO – 1658 T/yr
- PM_{total} – 64 T/yr
- PM_{10} (particulate matter with an aerodynamic diameter of 10 microns or less) – 17 T/yr.

In addition, a coal-fired power plant would have carbon dioxide (CO_2) emissions of approximately 19,000,000 T/yr, which could contribute to climate change (Duke 2009c). Further discussion regarding CO_2 is found in Section 9.2.5.

Coal and limestone (calcium carbonate) for a pulverized coal-fired plant would be delivered to the site by train. The review team assumes that the coal and limestone could be delivered using the same railroad spur proposed to service Lee Nuclear Station Units 1 and 2. The plant is expected to consume approximately 6.6 million T/yr of pulverized bituminous coal with ash content of 9.8 percent (Duke 2009c). Lime or limestone slurry is injected into the hot effluent combustion gases to remove entrained SO_2. The lime-based scrubbing solution reacts with SO_2 in the flue gas to form calcium sulfite or calcium sulfate, which precipitates and forms sludge. The sludge is then removed from the process and dewatered. Final disposition of this waste is site-specific; however, opportunities for recycling are sometimes available.

The acid rain requirements in the Clean Air Act capped nationwide SO_2 emissions from power plants. Duke would need to obtain sufficient pollution credits from a set-aside pool or purchases on the open market to cover annual emissions from the coal-fired generation alternative. There is no market-based allowance system used for the emissions of NO_x.

The coal-fired generation alternative at the Lee Nuclear Station site would require a Prevention of Significant Deterioration (PSD) Permit and an operating permit under the Clean Air Act Amendments of 1990. The coal-fired generation alternative would need to comply with the new source performance standards (NSPSs) for such plants in 40 CFR 60, Subpart Da. The standards establish emission limits for PM and opacity (40 CFR 60.42Da), SO_2 (40 CFR 60.43Da), NO_x (40 CFR 60.44Da), and mercury (40 CFR 60.45Da).

The EPA has various regulatory requirements for visibility protection in 40 CFR 51, Subpart P, including a specific requirement for review of any new major stationary source in an area designated as in attainment or unclassified under the Clean Air Act (40 CFR 51.307(a)). Criteria pollutants under the Clean Air Act are lead, ozone, particulates, CO, NO_2, and SO_2. Ambient air quality standards for criteria pollutants are in 40 CFR Part 50. The Lee Nuclear Station site in Cherokee County, South Carolina, is in an area designated as in attainment or unclassified for all criteria pollutants (40 CFR 81.347).

According to the EPA (EPA 2010a), the Charlotte-Gastonia-Rock Hill, North Carolina-South Carolina metro area is listed as having an 8-hour nonattainment status that is covered under Part D, Title I of the Clean Air Act regarding ozone. "Part D" is not a classification but is included as an indication of the requirements under the Clean Air Act that apply to areas of nonattainment. Additionally, Spartanburg, Anderson, and Greenville Counties have only recently been classified as being in attainment for ozone as of April 2008 under CFR Title 40 reporting guidelines.

Section 169A of the Clean Air Act establishes a national goal of preventing future and remedying existing impairment of visibility in mandatory Class I Federal areas when an impairment occurs due to air pollution from human activities. In addition, EPA regulations provide that for each mandatory Class I Federal area located within a State, the State must establish goals that provide for reasonable progress toward achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for days when visibility is most impaired over the period of the implementation plan and verify no degradation in visibility for the least visibility-impaired days over the same period (40 CFR 51.308(d)(1)). The closest mandatory Class I Federal area is Linville Gorge, which is approximately 65 mi northwest of the proposed site. If the coal-fired generation alternative were located close enough to a mandatory Class I area to affect visibility, additional air-pollution control requirements could be imposed. The preceding emissions estimate assumed the use of appropriate controls, which would limit the potential for impairment concerns.

South Carolina is one of 27 states whose stationary sources of criteria pollutants would have been subject to revised emission limits for SO_2 and NO_x under the Clean Air Interstate Rule (CAIR). South Carolina stationary sources of SO_2 and NO_x would be subject to this rule, as well as complementary regulatory controls developed at the State level (http://www.epa.gov/cair/index.html). On July 6, 2011, the EPA announced the finalization of the Cross-State Air Pollution Rule (CSAPR, previously referred to as the Transport Rule) as a response to previous court decisions and as a replacement to the CAIR. Following the August 2012 decision by the U.S. Court of Appeals for the D.C. Circuit to vacate the CSAPR, the CAIR remains in effect (EPA 2013a). Fossil fuel power plants in South Carolina would be subject to the CAIR and would be required to reduce emissions of SO_2 and NO_x to help reduce downwind ambient concentrations of fine particulates ($PM_{2.5}$) and ozone. However, the review team recognizes that the environmental impacts of air emissions from the coal-fired plant would be significantly greater than those from the Lee Nuclear Station site, even after application of the CAIR.

The EPA determined that coal-fired and oil-fired electric utility steam-generating units are significant emitters of the following hazardous air pollutants (HAPs): arsenic, beryllium, cadmium, chromium, dioxins, hydrogen chloride, hydrogen fluoride, lead, manganese, and mercury (65 FR 79825). The EPA concluded that mercury is the HAP of greatest concern and that (1) a link exists between coal combustion and mercury emissions, (2) electric utility steam-generating units are the largest domestic source of mercury emissions, and (3) certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects resulting from mercury exposures caused by the consumption of contaminated fish (65 FR 79825). On March 28, 2013, the EPA published a final rule with updates to emission standards, including mercury, for power plants under the Mercury and Air Toxics Standards (EPA 2013c). This rule became effective on April 24, 2013. However, the review team recognizes that the environmental impacts of air emissions from the coal-fired plant would be significantly greater than those from the Lee Nuclear Station, even after application of any new mercury emissions standards.

In the license renewal GEIS (NRC 2013a) the NRC staff indicates that air-quality impacts from a coal-fired power plant can be significant. The NRC staff also provides estimates of CO_2 and other emissions (NRC 2013a). Adverse human health effects, such as cancer and emphysema, have been associated with the byproducts of coal combustion. The fugitive dust emissions from construction activities would be mitigated using best management practices (BMPs), and would be temporary. Overall, the review team concludes that air-quality impacts from construction and operation of the coal-fired generation alternative at the Lee Nuclear Station site, despite the availability of BACT, would be MODERATE. The impacts would be clearly noticeable in the region but would not destabilize air quality.

Waste Management

Coal combustion generates waste in the form of ash, and equipment for controlling air pollution generates additional ash, spent selective catalytic reduction (SCR) catalyst, and scrubber sludge. The coal-fired generation alternative would generate approximately 652,000 T/yr of ash. Significant quantities of the fly ash may be recycled for use in commodity products such as concrete, thereby limiting the total landfill volume. The coal-fired generation alternative would also generate more than 1,000,000 T/yr of flue gas scrubber sludge in the form of gypsum, which can also be recycled for use in wall board manufacturing (Duke 2009c).

The process of filtering suspended solids from incoming raw water (from the Broad River) can generate significant quantities of sludge, as well as general water-treatment sludge such as would be found in cooling-tower basins. Disposal of solid wastes could noticeably affect land use by requiring the devotion of substantial areas of land to provide landfill space. The total estimated volume of these two types of sludge exceeds 1800 T/yr, and would be disposed of in State-approved landfills either onsite or offsite.

In May 2000, the EPA issued a "Notice of Regulatory Determination on Wastes from the Combustion of Fossil Fuels" (65 FR 32214). The EPA concluded that national regulation is warranted under Subtitle D of the Resource Conservation and Recovery Act of 1976, as amended (RCRA) when coal-combustion wastes are disposed of in landfills or surface impoundments, and that regulations under Subtitle D of RCRA (or modifications to existing regulations under the authority of the Surface Mining Control and Reclamation Act) are warranted when the wastes are used to fill surface impoundments or underground mines (65 FR 32214). In June 2010, the EPA proposed national standards regulating the disposal of coal-combustion wastes; they are currently evaluating two forms of regulation under Subtitle C and Subtitle D of RCRA (75 FR 35128).

Waste impacts on land use, groundwater, and surface water could extend beyond the operating life of the plant if leachate and runoff from the waste storage or coal pile area occurs. With appropriate controls and monitoring, waste impacts are not likely to destabilize any land or water resources. After closure of the waste site and revegetation, the land could be repurposed. Construction-related debris would be generated during plant development activities and disposed in approved landfills.

For the reasons stated above, the review team concludes that the impacts from waste generated at the coal-fired generation alternative would be MODERATE. The impacts would be noticeable, but not destabilizing of any resources.

Human Health

Coal-fired power generation introduces worker risks from coal and limestone mining, worker and public risk from coal and lime/limestone transportation, and worker and public risk from coal-combustion waste disposal. In addition, "releases from coal combustion contain naturally occurring radioactive materials – mainly uranium and thorium" (Gabbard 1993).

The EPA and State agencies base air emission standards and requirements on human health impacts. These agencies impose site-specific emission limits, as needed, to protect human health. Air emissions from a coal-fired power-generation plant located at the Lee Nuclear

Station site would be regulated by the South Carolina Department of Health and Environmental Control (SCDHEC). Given that the plant would have to comply with health-informed standards in the Clean Air Act and other relevant air emissions regulations, the review team concludes the human health impacts from the construction and operation of coal-fired generation at the Lee Nuclear Station site would be SMALL.

Other Impacts

Land Use

For the coal-fired alternative, approximately 2000 ac of land would need to be converted to industrial use for the power block, infrastructure and support facilities, ash and solids disposal, and coal and limestone storage and handling (Duke 2009c). This is more than twice the estimated 946-ac onsite land demand for the proposed nuclear station and would exceed the availability of land on the 1928-ac Lee Nuclear Station Site (see Section 4.1.1). Even if it were possible to fit the coal-fired generation facilities onto the Lee Nuclear Station site, the facilities would be crowded and there would be little opportunity to avoid environmentally sensitive land areas such as wetlands, floodplains, steep slopes, and prime farmland. The review team expects that Duke would either have to acquire substantial areas of additional land adjoining the site or find another site.

The land required for new transmission-line corridors would be similar to that reported in Section 4.1.3 for the transmission lines associated with the proposed nuclear facility. Land-use impacts would be noticeable to residents in the surrounding landscape, as described in Section 4.1.3. Land-use changes would also be expected to occur in the offsite coal-mining area supplying coal for the plant. The 1996 version of the GEIS (NRC 1996) estimated that approximately 22,000 ac of land would be needed for coal mining and waste disposal to support a 1000-MW(e) coal-fired plant during its operational life; this would scale up to approximately 48,000 ac for a 2200-MW(e) facility. This commitment of land for coal mining would likely have a noticeable effect on the availability of land in most regions of the United States.

Construction and operation of Make-Up Pond C would result in the permanent commitment of approximately 2110 ac of land, approximately 620 ac of which would be permanently impounded and flooded (see Section 4.1.2). Based on the inability to readily fit the proposed coal-fired generation facilities on the Lee Nuclear Station site as well as the overall amount of land affected due to the construction and operation of Make-Up Pond C, mining, and waste disposal, the review team concludes that land-use impacts would be MODERATE.

Water Use and Quality

The impacts on water use and quality from constructing and operating the coal-fired generation alternative at the Lee Nuclear Station site would be comparable to the impacts associated with a new nuclear power station. Cooling water would be withdrawn directly from the Make-Up Ponds (A, B, and C), which are supplemented by withdrawals from the Broad River. Plant discharges would consist mostly of cooling-tower blowdown, characterized primarily by an increased temperature and concentration of dissolved solids relative to the receiving waterbody, and intermittent low concentrations of biocides (e.g., chlorine). Treated process waste streams and sanitary wastewater may also be discharged. All discharges would be regulated by the SCDHEC through a National Pollution Discharge Elimination System (NPDES) permit. Indirectly, water quality could be affected by acids and mercury from air emissions: coal-fired power plants using wet flue gas desulphurization typically capture these compounds and dispose of them using approved regulatory paths. Water consumption would be similar to the proposed project, predominantly due to evaporative loss from the cooling towers. Overall, the review team concludes that the water-use and water-quality impacts would be SMALL.

Ecology

The coal-fired generation alternative would introduce impacts from construction and new incremental impacts from operations. As discussed in Section 4.3, impacts from building Make-Up Pond C may include wildlife habitat loss and fragmentation, reduced productivity, and a local reduction in biological diversity. Noticeable impacts could also occur at the proposed site and at the sites used for coal and limestone mining. As discussed in Section 5.3.1, cooling-tower drift would have only minimal impacts on terrestrial habitats on and near the site. The review team therefore concludes that the terrestrial ecological impacts would be MODERATE due to the potential impacts associated with Make-Up Pond C, and the large land area affected by mining.

As explained in Section 4.3.2, building Make-Up Pond C would substantially alter the aquatic ecology of London Creek. Extraction of cooling makeup water could affect aquatic resources in the Broad River and makeup ponds. Disposal of fly ash could affect water quality and the aquatic environment, but effective BMPs are readily available. Impacts from a coal-fired power plant on threatened and endangered species at the site would be similar to the impacts from a new nuclear power station. The review team concludes that the impacts on aquatic ecology would likely be MODERATE.

Socioeconomics

Adverse socioeconomic impacts would result from the approximately 1250 construction workers and approximately 2000 person peak workforce (Duke 2009c) used to build and operate the coal-fired generation alternative. Most construction workers would be temporary. Demands on housing and public services during construction would be SMALL. The review team concludes that impacts would be MODERATE (adverse) and localized to the vicinity of the Lee Nuclear Station site due to traffic- and transportation-related issues. During the period of plant construction and operation, the coal-fired generation alternative would likely pay a fee in lieu of taxes to Cherokee County that would be similar to the proposed project. Additional tax revenue would be expected from the influx of workers. The review team concludes that this would have a LARGE and beneficial impact on the county, and a SMALL and beneficial impact elsewhere in the region.

The four coal-fired units would have power-block structures up to 200 ft tall that would be visible offsite during daylight hours, particularly from the Broad River public access roads and McKowns Mountain Road. The four exhaust stacks could be as high as 650 ft. The stacks and associated emissions would likely be visible in daylight hours at distances greater than 10 mi. Cooling towers and associated plumes would also have aesthetic impacts. Mechanical draft cooling towers would be approximately 100 ft high. The power-block units and associated stacks and cooling towers would also be visible at night because of outside lighting. The Federal Aviation Administration (FAA) generally requires that all structures exceeding an overall height of 200 ft above ground level have markings and/or lighting so they do not impair aviation safety (FAA 2007). The visual effects of a new coal-fired power plant at the Lee Nuclear Station site could be further mitigated by landscaping and building color consistent with the environment. Visual impacts at night could be mitigated by reduced lighting, provided it meets FAA requirements, and appropriate shielding. Additionally, new transmission lines, as described in Section 3.2.2.3, would be expected to have noticeable aesthetic impacts associated with the steel towers, which are up to 190 ft. tall. The review team concludes the aesthetic impacts associated with the coal-fired generation alternative and associated new transmission lines at the Lee Nuclear Station site would be MODERATE.

The coal-fired generation alternative would introduce mechanical sources of noise that would be audible offsite. Sources contributing to the noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations and mechanical draft cooling towers. Intermittent sources include the equipment related to coal handling, solid-waste disposal, transportation related to coal and lime/limestone delivery, outside loudspeakers, and employees commuting to work. Noise impacts associated with rail delivery of coal and lime/limestone would be most significant for residents living near the facility and along the rail route. Given the necessary frequency of train transport to supply coal and limestone and the fact that many people are likely to be within hearing distance of the rail line, the review team concludes that the impacts of noise on residents in the vicinity of the facility and rail line would be MODERATE.

Environmental Justice

As discussed in Sections 4.5 and 5.5 of this EIS, no environmental pathways at the Lee Nuclear Station site result in disproportionate and adverse environmental impacts on identified minority or low-income populations in the 50-mi region. Therefore, the review team concludes that the environmental justice impacts on minority and low-income populations associated with the coal-fired generation alternative at the Lee Nuclear Station site would also be SMALL.

Historic and Cultural Resources

Impacts of locating the coal-fired generation alternative at the Lee Nuclear Station site would be similar to the impacts of locating a new nuclear power plant at the Lee Nuclear Station site. As discussed in Section 4.6, building and operating Make-Up Pond C would result in noticeable impacts on a historic cemetery. In addition, the Lee Nuclear Station site contains similar historic and cultural resources that may be affected by expanded ground-disturbing activities or visual intrusions. Cultural resource investigations would be needed for all areas of potential disturbance at the plant site; any offsite affected areas, such as mining and waste-disposal sites; and along new roads and transmission lines. These investigations would include field surveys; consultation with the appropriate State Historic Preservation Officer, American Indian Tribes, and the public; and possible mitigation of adverse effects from ground-disturbance or visual intrusions. Given the known historic and cultural resources in the area of the proposed Make-Up Pond C, the review team concludes that the historic and cultural resource impacts would be MODERATE.

Conclusion

Table 9-1 summarizes the impacts of building and operating the coal-fired generation alternative at the Lee Nuclear Station.

Table 9-1. Summary of Environmental Impacts of the Coal-Fired Generation Alternative

Impact Category	Impact	Comment
Air quality	MODERATE	SO_2 – 7814 T/yr NO_x – 1658 T/yr CO – 1658 T/yr PM_{total} – 64 T/yr PM_{10} – 17 T/yr CO_2 – 19,000,000 T/yr Small amounts of HAPs
Waste Management	MODERATE	Total waste volume would be approximately 652,000 T/yr of ash and an estimated additional 1 million T/yr of scrubber sludge.
Human health	SMALL	Regulatory controls and oversight would be protective of human health.

Table 9-1. (contd)

Impact Category	Impact	Comment
Land use	MODERATE	Uses approximately 2000 ac for power block and related facilities (greater than total land area of the site); coal handling, storage, and transportation facilities; infrastructure facilities; waste disposal; and cooling-water facilities. Additional land would be required for Make-Up Pond C and new transmission-line corridors. Mining activities would have additional impacts at undetermined offsite locations.
Water use and quality	SMALL	Discharges would be subject to protective regulatory controls. Water use would be minimal.
Ecology	MODERATE	Uses the undeveloped upland area of the Lee Nuclear Station site. Potential forest loss and fragmentation, reduced productivity and biological diversity could impact terrestrial ecology. Building of Make-Up Pond C would be expected to noticeably affect aquatic ecology due to inundation and flooding of London Creek. Additional impacts are associated with new transmission-line corridors and reconstruction of the railroad spur.
Socioeconomics	MODERATE (adverse) to LARGE (beneficial)	Construction-related impacts would be minor and adverse with the following exceptions: traffic-related impacts would be noticeable and adverse; and construction-related economic impacts would be minor and beneficial everywhere in the region, except for Cherokee County, where they would be substantial and beneficial. Impacts during operation would likely be smaller than during construction. The local tax base would benefit mainly during operations, where the impacts would be minor and beneficial in the region and noticeable and beneficial in Cherokee County. The power plant and new transmission lines would have noticeable adverse aesthetic impacts. Some offsite noise impacts would occur during operations, resulting in a noticeable adverse impact.
Historic and cultural resources	MODERATE	Impacts would be similar to those associated with a new nuclear power station located at the Lee Nuclear Station site, including noticeable impacts on a historic cemetery from construction of Make-Up Pond C. Known cultural resources within the Lee Nuclear Station site and undiscovered resources in associated offsite developments could be impacted.
Environmental justice	SMALL	No environmental pathways exist by which the identified minority or low-income populations in the 50-mi region would be likely to suffer disproportionate and adverse environmental impacts.

9.2.2.2 Natural Gas-Fired Power Generation

For the natural-gas-fired alternative, the review team assumed the building and operation of four natural-gas combined-cycle (NGCC) units, each with a net capacity of 600 MW(e) at the Lee Nuclear Station site for a gross capacity of 2400 MW(e). The review team's selection of the combined-cycle units is consistent with Duke's recent experience in permitting and constructing the Buck and Dan River units, and is reasonable. The review team assumed the acquisition and use of the same transmission-line rights-of-way discussed in Section 3.2.2.3. The new natural-gas-fired generation units are assumed to have an operating life of 40 years (the same operating life as allowed initially for a nuclear plant under a COL, even though that number has no regulatory applicability to non-nuclear power plants).

The review team also considered and evaluated the construction and operation of Make-Up Pond C, recognizing that the demand for water consumption from a combined-cycle power plant would be less than either the proposed project or the coal-fired alternative. However, assuming the use of a closed-cycle cooling system and mechanical draft cooling towers located at the Lee Nuclear Station site, the review team concluded (through confirmatory analysis) that Make-Up Pond C would still be required, though possibly smaller in total surface area and volume. Further discussion regarding cooling water and Make-Up Pond C alternatives can be found in Section 9.4.1.

Air Quality

Natural gas is a relatively clean-burning fuel. When compared with a coal-fired plant, natural-gas-fired plants release similar types of emissions such as NO_x and PM, but in significantly lower quantities. A new natural-gas-fired power-generation plant would require a PSD Permit and a State-specific operating permit under the Clean Air Act, and would be subject to the NSPSs specified in 40 CFR Part 60, Subparts Da and GG, which establish emission limits for particulates, opacity, SO_2, and NO_x. Final permitting to operate the plant would require applicable BACT as part of the new source review requirements under Title 1 of the Clean Air Act.

The EPA has various regulatory requirements for visibility protection in 40 CFR 51, Subpart P, including a specific requirement for review of any new major stationary source in areas designated as in attainment or unclassified under the Clean Air Act. As previously discussed, the Lee Nuclear Station site in Cherokee County, South Carolina, is in an area designated as in attainment or unclassified for all criteria pollutants (40 CFR 81.347).

Section 169A of the Clean Air Act establishes a national goal of preventing future impairment of visibility and remedying existing impairment in mandatory Class I Federal areas when impairment is from air pollution caused by human activities. In addition, EPA regulations provide that for each mandatory Class I Federal area located within a State, State regulatory agencies must establish goals that provide for reasonable progress toward achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most impaired days over the period of the implementation plan and ensure no degradation in visibility for the least-impaired days over the same period (40 CFR 51.308(d)(1)). As previously discussed, the closest Class I Federal area is located approximately 65 mi northwest of the Lee Nuclear Station site. If the natural-gas-fired alternative were located close enough to a mandatory Class I area to affect visibility, additional air-pollution control requirements could be imposed. The preceding emissions estimate assumed the use of appropriate controls that would limit the potential for impairment concerns.

Emission estimates are based on “as-fired” and controlled conditions. The review team calculated the following emissions estimates using EPA (2000) AP-42 Emission Factors guidelines for stationary internal combustion sources. The review team also assumed that the NGCC units would be equipped with conventional and commonly used emission control technology:[(a)]

- SO_2 – 31 T/yr
- NO_x– 546 T/yr
- CO – 207 T/yr
- PM_{total} – 105 T/yr
- PM_{10} – 105 T/yr.

In addition, the review team estimates that the natural-gas-fired alternative would have CO_2 emissions of 6,071,000 T/yr.

The fugitive dust emissions from construction activities would be mitigated using BMPs and would be temporary. Other construction and operation impacts, such as the development and use of material laydown areas and parking, would be minor.

The impacts of emissions from the natural-gas-fired alternative would be noticeable, but would not be sufficient to destabilize air resources. Overall, the review team concludes that air-quality impacts resulting from construction and operation of the natural-gas-fired alternative at Lee Nuclear Station site would be SMALL to MODERATE.

Waste Management

In the 1996 version of the GEIS, the NRC staff concluded that waste generation from natural-gas-fired technology would be minimal (NRC 1996). Wastes generated at conventional NGCC plants include catalysts and materials from the control of NO_X and CO emissions. These materials contribute to waste-disposal needs, and thus require removal over time. Waste generation at an operating NGCC plant would be largely limited to typical operations and maintenance waste. Construction-related debris would be generated during construction activities. Overall, the review team concludes that waste impacts from the operation of the natural-gas-fired alternative would be SMALL.

(a) The review team assumed a standard “2X1” configuration for a single unit total of 600 MW(e), and annual natural-gas consumption of 110,376,000 million BTU/yr, SCR at 90 percent conversion, and CO catalyst at 75 percent conversion.

Human Health

The risks from NGCC air emissions may be attributable to compounds that contribute to ozone formation, which in turn contribute to health risks. Air emissions from the natural-gas-fired alternative at the Lee Nuclear Station site would be regulated by the SCDHEC. The human health effect is expected to be either undetectable or minor. Overall, the review team concludes the impacts on human health would be SMALL.

Other Impacts

Land Use

Large NGCC plants can be sited on relatively small parcels of land, and are estimated to require only about 200 ac for the power block and support facilities (Duke 2008g). These facilities could be readily situated within the 1928-ac Lee Nuclear Station site with no more than minimal encroachment into environmentally sensitive land areas such as wetlands, floodplains, steep slopes, and prime farmland. As proposed, the natural-gas-fired alternative would be expected to use land mostly within the 750 ac already disturbed at the Lee Nuclear Station site for the construction of the power blocks. There are four natural-gas pipelines located approximately 4 mi northwest of the Lee Nuclear Station site. Assuming a right-of-way width of 100 ft, the review team estimates a 4-mi natural-gas pipeline would encompass approximately 48 ac of land. The addition of baseload-capable NGCC units at the Lee Nuclear Station site would require an expansion of natural-gas trunkline capacity, which would include the addition of approximately 50 to 60 mi of new pipeline. Duke has indicated this could be accomplished within the existing right-of-way, minimizing disturbances to the affected areas (Duke 2011e). Additionally, the 1996 version of the GEIS (NRC 1996) estimated that approximately 3600 ac. of land would be required for wells, collection stations, and pipelines to bring the natural gas to a 1000-MW(e) NGCC facility. For an NGCC facility of 2400 MW(e), the review team estimates the additional land required for gas production and delivery would be 8640 ac. However, due to the proximity of the Lee Nuclear Station site to existing natural-gas infrastructure, and the ability to use the existing right-of-way, the impacts from developing the natural-gas infrastructure should be minimized.

Although the NGCC units would require less cooling water than the proposed nuclear units, the building and operation of Make-Up Pond C would still be required to provide supplemental cooling water to the NGCC units during periods of drought. The review team considered Duke’s analysis and conducted a confirmatory assessment, concluding that Make-Up Pond C would still be required, though likely using a smaller geographic footprint. Duke estimated that Make-Up Pond C built to support the natural-gas-fired alternative would be approximately 363 ac (as compared to a 643-ac pond that would be required for coal or nuclear). Although the pond would be smaller, it would still result in the flooding and permanent commitment of substantial land areas in the London Creek drainage (Duke 2011e). The review team expects that a substantial additional portion of the Make-Up Pond C site would be required to accommodate ancillary facilities and activities associated with the pond, such as spoils disposal, vegetation maintenance, a pumphouse, and access roads and other utilities (described in Section 4.1.2). Even though the combined land demands for the smaller Make-Up Pond C would likely be substantially lower than the roughly 1047 ac estimated for the nuclear Make-Up Pond C, the review team expects that Duke would still have to acquire and permanently dedicate the entire 2110-ac Make-Up Pond C site to the pond. Duke would still have to acquire and remove the 86 privately owned housing units, as described in Section 4.1.2. The overall effects would be similar to those described for the Lee Nuclear Station in Section 4.1.2.

The land required for new transmission-line corridors would be similar to that reported in Section 4.1.3 for the transmission lines associated with the proposed nuclear facility. Based on the overall amount of land affected, particularly the land needed for Make-Up Pond C and the new transmission-line corridors, the review team concludes that land-use impacts from the natural-gas-fired alternative at the Lee Nuclear Station site would be MODERATE.

Water Use and Quality

The NGCC plants would consume less water for cooling than the coal or nuclear alternatives. The impacts on water use and quality from building and operating the natural-gas-fired alternative at the Lee Nuclear Station site would be similar to or less than the impacts associated with constructing and operating a new nuclear facility. Closed-cycle cooling with cooling towers is assumed. Ground disturbance might result in some impacts on surface-water quality in the form of increased sediment loading in stormwater runoff from erosion in the active construction zones; however, the required permits, certifications and stormwater pollution prevention plan (SWPPP) would call for the implementation of BMPs to minimize impacts, as discussed for the nuclear plant in Section 4.2. The impacts on water quality from erosion and sedimentation during construction of a natural-gas-fired power plant were characterized in the 1996 version of the GEIS 7 as SMALL (NRC 1996). The NRC also noted in the GEIS that the impacts on water quality from operations would be similar to, or less than, the impacts from other generating technologies. Overall, the review team concludes that impacts on water use and quality would be adequately controlled by permits and, therefore, would be SMALL.

Ecology

As discussed in Section 4.3, impacts from building Make-Up Pond C may include wildlife habitat loss and fragmentation, reduced productivity, and a local reduction in biological diversity. While the pond would be smaller, the habitat losses and disturbances resulting from building the pond would still be noticeable. As discussed in Section 5.3.1, cooling-tower drift would have only minimal impacts on terrestrial habitats on and near the site. The review team therefore concludes that the terrestrial ecological impacts would be MODERATE.

Similar to the impacts described in Section 4.3.2, building Make-Up Pond C, even one of only 363 ac, would substantially alter the aquatic ecology of London Creek. Extraction of cooling makeup water could affect aquatic resources. Impacts from the natural-gas-fired alternative on Federally listed threatened or endangered species would be similar to the impacts from a new nuclear power station. The review team concludes that the impacts on aquatic ecology would likely be MODERATE.

Socioeconomics

Impacts would result from the approximately 800 workers needed to construct the natural-gas-fired alternative, the demands on housing and public services during construction, and the loss of jobs after construction. The natural-gas-fired alternative would require approximately 150 permanent operators and staff once operational (Duke 2008q). Overall, the review team concludes that these impacts would be SMALL because of the mitigating influence of the site's proximity to the surrounding population area and the relatively small number of workers needed to construct and operate the plant in comparison to nuclear and coal-fired generation alternatives. The natural-gas-fired alternative would likely pay a fee in lieu of taxes to Cherokee County. Additional tax revenue would be expected from the influx of workers. Though this would likely be less than the value assigned to the proposed project, the review team concludes that the fee and tax revenue would have at least a MODERATE beneficial impact on the county.

The natural-gas-fired alternative would have several features visible during daylight hours from offsite including the heat-recovery steam generators, exhaust stacks, cooling towers, and water vapor plumes. Noise and light from the NGCC units would be detectable offsite during construction and operation. Additionally, new transmission lines, as described in Section 3.2.2.3, would be expected to have noticeable aesthetic impacts associated with the steel towers, which are up to 190 ft tall. Overall, the review team concludes that the aesthetic impacts associated with the natural-gas-fired alternative at the Lee Nuclear Station site and the new transmission-line right-of-way would be MODERATE.

Environmental Justice

As discussed in Sections 4.5 and 5.5 of this EIS, no environmental pathways at the Lee Nuclear Station site result in disproportionate and adverse environmental impacts on identified minority or low-income populations in the 50-mi region. Therefore the review team concludes that the environmental justice impacts on minority and low-income populations associated with the natural-gas-fired alternative at the Lee Nuclear Station site would be SMALL.

Historic and Cultural Resources

Impacts of the natural-gas-fired alternative located at the Lee Nuclear Station site would be generally similar to the impacts for a new nuclear power station. As discussed in Section 4.6, building Make-Up Pond C would result in noticeable impacts on a historic cemetery. Those impacts would still occur with a pond of 363 ac. Cultural resource investigations would likely be needed for any onsite property that has not been previously surveyed, including Make-Up Pond C, and in any offsite affected areas, such as those containing new transmission lines and gas pipelines. These investigations would include field surveys; consultation with the appropriate State Historic Preservation Officer, American Indian Tribes, and the public; and possible mitigation of the adverse effects from ground disturbance or visual intrusions. Given the known historic and cultural resources in the area of the proposed Make-Up Pond C, the review team concludes that the historic and cultural resource impacts would be MODERATE.

Conclusion

Table 9-2 summarizes the impacts of building and operating the coal-fired generation alternative at the Lee Nuclear Station.

Table 9-2. Summary of Environmental Impacts of the Natural-Gas-Fired Alternative

Impact Category	Impact	Comment
Air quality	SMALL to MODERATE	SO_2 – 31 T/yr NO_x – 546 T/yr CO – 207 T/yr PM_{10} – 105 T/yr CO_2 – 6,071,000 T/yr
Land use	MODERATE	Approximately 200 ac would be needed onsite for the power block, cooling towers, and support systems. Additional land would be needed for a 4-mi gas pipeline, Make-Up Pond C, transmission-line corridor, infrastructure, and other facilities.
Water use and quality	SMALL	Impacts would be similar to or less than the impacts for a new nuclear power plant located at the site.
Ecology	MODERATE	Would primarily use previously disturbed areas of the Lee Nuclear Station site. The building of Make-Up Pond C, inundating about 363 ac, would be expected to noticeably affect aquatic ecology due to inundation and flooding of London Creek. Additional impacts are associated with new transmission lines and reconstruction of the railroad spur.
Socioeconomics	MODERATE (adverse) to MODERATE (beneficial)	Construction and operations workforces would be relatively small in comparison to a nuclear or coal-fired power plant. The additional revenue to the local tax base, while smaller than for a nuclear or coal-fired plant, would be noticeable and beneficial. Impacts during operation would be minor because of the small workforce involved. The plant and new transmission lines would have noticeable aesthetic impacts.

Table 9-2. (contd)

Impact Category	Impact	Comment
Historic and cultural resources	MODERATE	Impacts would be similar to those associated with a new nuclear power station located at the Lee Nuclear Station site, including noticeable impacts due to the construction of Make-Up Pond C. Avoidance or mitigation of known cultural resources would be expected in accordance with State and Federal law.
Waste management	SMALL	Waste generation, including that from spent catalyst used for emissions control, would be minimal.
Human health	SMALL	Regulatory controls and oversight would be protective of human health.
Environmental justice	SMALL	There are no environmental pathways by which the identified minority or low-income populations in the 50-mi region would be likely to suffer disproportionate and adverse environmental impacts

9.2.3 Other Alternatives

This section discusses other energy alternatives, the review team's conclusions about the feasibility of each alternative, and the review team's basis for its conclusions. New nuclear units at the proposed site would provide baseload generation. Any feasible alternative to the new units would need to be capable of generating baseload power with high availability and capacity factors. As part of the annual IRP processes, and in accordance with NUREG-1437, *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (NRC 1996), Duke explored a wide range of competitive power generating alternatives including conventional, demonstrated, and emerging technologies (Duke 2012a). The review team reviewed the information Duke submitted, conducted an independent review, and consulted additional resources as needed. The review team finds that the following generation options are not reasonable alternatives to the baseload generation the proposed Lee Nuclear Station Units 1 and 2 would provide.

The review team has not assigned significance levels to the environmental impacts associated with the alternatives discussed in this section because, in general, the generation alternatives would likely require installation at a location other than the proposed Lee Nuclear Station site. Any attempt to assign significance levels would require speculation about the unknown site(s).

9.2.3.1 Oil-Fired Power Generation

The EIA's reference case projects that oil-fired power plants would not account for any new electric power generation capacity in the United States through the year 2035 (DOE/EIA 2011), although oil-firing in combustion turbines is often used to supplement natural-gas feed stock.

Oil-fired generation is more expensive than nuclear, natural-gas-fired, or coal-fired generation options. In addition, future increases or broad speculation in oil prices and oil markets are expected to make oil-fired generation increasingly more expensive. The high cost of oil has resulted in a decline in its use for electricity generation. In the 1996 version of the GEIS (NRC 1996), the NRC staff estimated that construction of a 1000-MW(e) oil-fired plant would require about 120 ac of land with additional acreage expected to be committed to onsite fuel storage. Operation of an oil-fired power plant would have environmental impacts similar to those of a comparably sized coal-fired plant (NRC 1996).

For the preceding economic and environmental reasons, the review team concludes that an oil-fired power plant at or in the vicinity of the proposed Lee Nuclear Station site would not be a reasonable alternative to construction and operation of a 2200-MW(e) nuclear power plant supplying baseload electricity.

9.2.3.2 Wind Power

The Lee Nuclear Station site is in a wind power Class 1 region with average wind speed lower than 5.6 m/s (DOE 2009b). Class 1 regions have the lowest potential for generation of wind energy and are considered unsuitable for the development of wind energy (Dahle et al. 2008). The coastal regions of North Carolina and South Carolina are recognized as being capable of supporting offshore utility-scale as well as isolated onshore wind generation (NREL 2009a). Though outside of the respective service territory, the continuing development of wind-generation resources as part of Duke's resource portfolio may be conducted through purchased power options, the purchase of renewable energy credits (RECs), or joint ventures. Duke is actively pursuing the development of wind-generation resources as part of its renewable energy resource portfolio. As an example, and in accordance with North Carolina's general requirements to generate or procure resources equal to 3 percent of its 2011 retail sales, Duke has entered into agreements to procure out-of-state RECs for wind to the extent possible (NCUC 2012a). It is noted that these are not capacity purchases, but energy purchases. Reflective of the growing use of wind resources, the NCUC has recently approved a Certificate of Public Convenience and Necessity (CPCN) to Atlantic Wind, LLC for the construction and operation of a 300-MW(e) wind facility consisting of up to 150 wind turbines in Pasquotank and Perquimans Counties, North Carolina (NCUC 2011b).

Newer wind turbines typically operate at approximately a 36 percent capacity factor (DOE 2009b), compared with 90 percent for a baseload plant such as a nuclear power station (NEI 2013). The largest operating wind farm has a more than 1000-MW generating capacity (Terra-Gen 2013); however, the installed capacities of most wind farms are under 200 MW. Although some modern wind turbine designs are approaching 5 MW(e), it is likely that well over 800 average sized 2.5-MW(e) wind turbines would be required to match the capacity of the 2200 MW(e) of the proposed nuclear units. Assuming an average net capacity factor in North Carolina of 32 percent (LaCapra Associates 2006), more than 2700 such wind turbines would be needed to generate a commensurate amount of energy to equal that expected from the proposed nuclear plants. An onshore or land-based utility-scale wind-generation plant would require on average about 84 ac/MW(e) of installed capacity, although much of this land could be used for other purposes (NREL 2009b). Using this assumption, as well as the assumption of an average net capacity factor of 32 percent, construction of land-based wind-generation facilities equivalent to the 2200 MW(e) that could be provided by the proposed Lee Nuclear Station units could require more than 500,000 ac of land. As an example, the Atlantic Wind, LLC application for the CPCN indicated that approximately 20,000 ac would be involved for the 300-MW(e) project (NCUC 2011b). If forested, tree cover would have to be cleared from all or much of the land resulting in substantial aesthetic impacts, cultural resource impacts, and losses of habitat for forest-dwelling terrestrial wildlife. Portions of the land not immediately situated at a wind turbine structure could provide habitat for terrestrial wildlife favoring old-field or grassland habitat, although the value of the habitat might be somewhat compromised by its proximity to the turbine blades. The moving turbine blades could pose a risk of physical injury to wildlife attracted to the habitat. Because of the inherent variability of wind as a resource, the capacity from wind turbines may supply firm deliverable power when coupled with a power source that is capable of being dispatched when the capacity is required such as energy-storage mechanisms (e.g., compressed air energy-storage, batteries) or additional resources such as pumped-storage hydropower (NPCC 2010). This requires both the wind resource and the storage mechanism to be within reasonable proximity of each other, and of commensurate power output when used singly or in combination. The EIA is not projecting any growth in pumped-storage capacity through 2035 (DOE/EIA 2011). In addition, the review team concludes in Section 9.2.3.4 that the potential for new hydroelectric development in North Carolina and South Carolina is limited. Therefore, the review team concludes that the use of pumped storage in combination with wind turbines to generate 2200 MW(e) is unlikely in North Carolina or South Carolina.

A conventional compressed air energy-storage (CAES) plant consists of motor-driven air compressors that use low-cost, off-peak electricity to compress air into an underground storage medium. During periods of high electricity demand, the stored energy is recovered by releasing the compressed air through a combustion turbine to generate electricity (NPCC 2010). There are other proposed configurations of CAES, however only two CAES plants are currently in operation. A 290-MW plant near Bremen, Germany, began operating in 1978. A 110-MW(e) plant located in McIntosh, Alabama, has been operating since 1991. Both facilities use mined salt caverns (Succar and Williams 2008). A CAES plant requires suitable geology such as an underground cavern for energy storage. A 268-MW(e) CAES plant coupled to a wind farm, the Iowa Stored Energy Park, was proposed for construction near Des Moines, Iowa. The facility would have used a porous rock storage reservoir for the compressed air (Succar and Williams 2008). However, this project has been terminated (ISEPA 2011). Other pilot, demonstration, prototype, and research projects involving CAES have been announced, including projects in California, New York, and Texas. To date, nothing approaching the scale of a 2200-MW(e) facility has been contemplated. Therefore, the review team concludes that the use of CAES in combination with wind turbines to generate 2200 MW(e) is unlikely in North or South Carolina.

The U.S. Department of Interior Minerals Management Service (MMS, now the Bureau of Ocean Energy Management, Regulation and Enforcement) has jurisdiction, as authorized in the Energy Policy Act of 2005, over alternative energy-related projects on the outer continental shelf (OCS), including wind power developments. In its final "Programmatic EIS for Alternative Energy Development and Production and Alternate Uses of facilities on the Outer Continental Shelf" (DOI 2007), the MMS considered the potential environmental, social, and economic impacts from wind energy (among other) projects on the OCS. The MMS indicated that the technologies used to extract energy on the OCS are "… relatively new and untested in the offshore environment of the OCS." In developing the programmatic EIS, the MMS focused on "… those technologies that are likely to be initiated–for research, demonstration, or commercial scale—within the 5- to 7-year time frame." In the time since the Programmatic EIS was finalized, no projects have been initiated on the OCS. MMS issued final regulations in April 2009 (74 FR 19638) to establish a program to grant leases, easements, and rights-of-way for renewable energy project activities on the OCS.

There are considerable challenges to both onshore and offshore wind turbines. The National Renewable Energy Laboratory (NREL) issued an analysis of offshore wind power in *Large-Scale Offshore Wind Power in the United States—Assessment of Opportunities and Barriers* (Musial and Ram 2010). As Musial and Ram indicate, "… the opportunities for offshore wind are abundant, yet the barriers and challenges are also significant. … Technological needs are generally focused on making offshore wind technology economically feasible and reliable and expanding the resource area to accommodate more regional diversity for future U.S. offshore projects." When energy policies mature and large-scale offshore wind-energy projects become technically feasible, they could play a significant role in U.S. energy markets. The NREL report considers the wind-energy potential and the proposed U.S. offshore wind projects and capacities; it divides wind-energy projects into two groups: those within State boundaries (within 3 nautical mi) and those in Federal waters. Regionally, there were two projects under consideration, neither of which appear to be moving forward at this time. One project was led by University of North Carolina (in conjunction with Duke) to study, install, and operate up to three wind turbines in Pamlico Sound, North Carolina. The other was a Federal lease project in Georgia estimated to be up to 10 MW(e) (Musial and Ram 2010). No other regional wind-energy projects were identified by NREL in either State or Federal waters.

For the preceding reasons, the review team concludes that wind power is not a reasonable alternative to construction and operation of a 2200-MW(e) nuclear power plant supplying baseload electricity.

9.2.3.3 Solar Power

Solar technologies use energy and light from the sun to provide heating and cooling, light, hot water, and electricity for consumers. Solar energy is converted to electricity using solar thermal technologies or photovoltaics (PVs). In grid-connected, utility-scale applications, solar power does not currently compete well with conventional nuclear and fossil-fueled technologies due to solar power's lower capacity factors and higher capital cost per kilowatt of capacity. Capacity factors of solar technologies are directly related to both solar resource and the conversion efficiency of the technology. An average capacity factor of PV cells in the United States is about 18 or 19 percent (DOE 2011c). The capacity factor in the Carolinas would fall somewhere between that of Boston (as high as 24 percent) and Miami (as high as 26 percent) if panels with two-axis tracking are used (DOE 2011c). The capacity factor for solar thermal systems[a] is about 20 to 28 percent without storage, and up to 40 to 50 percent with storage (DOE 2011c). Though solar technologies are not capable of generating traditional baseload power, the power produced may be stored and used when the sun is not shining when coupled to energy-storage mechanisms such as batteries. Large, utility-scale solar technologies also require a significant dedicated land area; NREL estimated from approximately 5 to 12 ac/MW of installed capacity for solar thermal and PV concentrators (NREL 2004). A solar-based power plant equivalent to the proposed project would require an estimated 11,000 to 26,400 ac of land.

Solar thermal technologies use concentrating devices to create temperatures suitable for bulk power production. There are several types of solar thermal power systems. The deployment of which technology depends on the solar resource, but utility-scale configurations are capable of generating enough heat to produce steam, which is used in a conventional steam turbine. The largest operational solar thermal plant is the 354-MW Solar Energy Generating Station located in southern California (Simons 2005).

For flat-plate, or PV type solar collectors, Duke has acceptable and available resources throughout the service territory, and while utility-scale installations require very large tracts of dedicated land, the advantage of PV solar technology lies in its deployment flexibility when used as part of a comprehensive distributed generation portfolio as evidenced by the significant contribution of solar PVs from customer-owned self-generation resources (Duke 2012a). As part of Duke's compliance with the North Carolina renewable energy portfolio standards (REPS) plan, Duke is engaged in several activities providing both solar capacity and RECs. Examples include Duke's 20-year purchase power agreement with Sun Edison for up to 15.5 MW(e), and long-term purchase agreements for both in-state and out-of-state RECs from solar applications (Duke 2012a).

(a) The use of concentrating solar power in the Carolinas is unlikely. The DOE considers select areas in seven states (Arizona, California, Colorado, Nevada, New Mexico, Texas, and Utah) as suitable for the development of concentrating solar power (DOE 2011c).

For the preceding reasons, the review team concludes that solar energy is not a reasonable alternative to construction and operation of a 2200-MW(e) nuclear power plant supplying baseload electricity.

9.2.3.4 Hydropower

Duke has over 1000 MW(e) of existing hydroelectric generating capacity. Approximately 1000 MW(e) of developable hydroelectric resources exist across North Carolina and South Carolina, with only one site capable of producing more than 76 MW(e) (INEEL1998). A much smaller subset would be accessible by Duke within its given service territory. Duke is actively engaged in multiple relicensing activities related to hydropower, but these projects will not increase current capacity. As stated in Section 2.3.3.1 of the GEIS (NRC 2013a), hydroelectric facilities have become difficult to site because of public concerns about flooding, destruction of natural habitat, and alteration of natural river courses. The EIA references projected stable electricity production from existing resources through 2035 (DOE/EIA 2011). In the 1996 version of the GEIS (NRC 1996), the NRC staff estimated that land requirements for hydroelectric power are approximately 1 million ac/1000 MW(e).

Due to the relatively low number of undeveloped hydropower resources available, and the large land-use and related environmental and ecological resource impacts associated with siting hydroelectric facilities large enough to produce 2200 MW(e), the review team concludes that hydropower is not a reasonable alternative to construction and operation of a 2200-MW(e) nuclear power plant supplying baseload electricity.

9.2.3.5 Geothermal Energy

Geothermal energy has an average capacity factor of 90 percent and can be used for baseload power where available. Geothermal plants are most likely to be sited in the western continental United States, Alaska, and Hawaii, where hydrothermal reservoirs are prevalent (DOE 2006). Neither South Carolina nor North Carolina has high-temperature geothermal resources that would be suitable for power generation (DOE 2008a, b).

Therefore, the review team concludes that a geothermal energy facility would not be a reasonable alternative to construction and operation of a 2200-MW(e) nuclear power plant supplying baseload electricity.

9.2.3.6 Wood Waste

A wood-burning facility can provide baseload power and operate with a high annual capacity factor (EPA 2007d; NREL 2013)and with thermal efficiency similar to a coal plant. Further, the State of North Carolina indicated that wood waste qualifies as a “Renewable Energy Resource” under Senate Bill 3 defining the new REPS. Duke, in the 2010 REPS compliance plan provided to the NCUC, indicates that it is actively pursuing biomass resources as part of its general requirement obligation including investigations into direct firing, co-firing, landfill gas, and combustion of waste gases (NCUC 2010b).

The fuels required are variable and site-specific. North Carolina and South Carolina have substantial wood-based biomass resources capable of producing tens of millions of pounds of usable biomass each year between commercial thinning operations and/or residue management. However, there are significant impediments to the use of wood waste to generate electricity, including the total cost of delivered fuel (harvesting and transportation), and the quantity of acceptable fuel required. The larger wood-waste power plants are 40 to 50 MW(e) in size. Estimates in the GEIS suggest that the overall level of construction impacts per megawatt of installed capacity would be approximately the same as that for a coal-fired plant, although facilities using wood waste for fuel would be built at significantly smaller scale (NRC 2013a). Similar to coal-fired plants, wood-waste plants require large areas for fuel storage and processing and involve similar types of combustion and combustion control equipment.

Considering that wood waste plants typically combust approximately 1 ton/hr to generate 1 MW(e) (ORNL 2004), it would take approximately 4.4 million lb/hr, or 35 billion lb/yr of wood waste to generate an equivalent amount of energy as the proposed project. Further, it is recognized that close proximity to the fuel source is a critical indicator of project feasibility; with such a high demand for wood waste, it would not be reasonable to conclude that such access could be afforded to a facility with such a high demand for fuel.

Because of uncertainties associated with obtaining sufficient wood and wood waste to fuel a baseload power plant, and the relatively small total generating capacity per unit, the review team determined that combustion of wood waste would not be a reasonable alternative to construction and operation of a 2200-MW(e) nuclear power plant supplying baseload electricity.

9.2.3.7 Municipal Solid Waste

Municipal solid-waste facilities incinerate waste and use the resultant heat to produce steam, hot water, or electricity. The combustion process can reduce the volume of waste by up to 90 percent and the weight by up to 75 percent (EPA 2009). Municipal waste combustion facilities use three basic types of technologies: mass burn, modular, and refuse-derived fuel (DOE/EIA 2001). Mass burning technologies are most commonly used in the United States. This group of technologies processes raw municipal solid waste “as is,” with little or no sizing, shredding, or separation before combustion.

Municipal solid-waste combustors generate an ash residue that is buried in landfills. The ash residue is composed of bottom ash and fly ash. Bottom ash refers to that portion of the unburned waste that falls to the bottom of the grate or furnace. Fly ash represents the small particles that rise from the furnace during the combustion process. Fly ash is generally removed from flue gases using fabric filters and/or scrubbers (DOE/EIA 2001).

Approximately 86 waste-to-energy plants are operating in the United States. These plants generate 2600 MW(e) or an average of approximately 30 MW(e) per plant (Michaels 2010). Given the small size of the plants, the review team concludes that generating electricity from municipal solid waste would not be a reasonable alternative to a 2200-MW(e) nuclear power plant supplying baseload electricity.

One additional generating resource that uses municipal solid-waste as a fuel derivative is the capture and combustion of landfill-based gas (LFG). In compliance with the REPS provisions, Duke Energy has executed several power purchase agreements for firm capacity from LFG generators (Duke 2012a). This is in addition to previously established power purchase agreements for up to 10 MW(e) of landfill gas based generation capacity from PURPA-qualifying facilities (Duke 2012a). Given the relatively small size of the plants and the finite number of usable resources, the review team concludes that generating electricity from LFG would not be a reasonable alternative to construction and operation of a 2200-MW(e) nuclear power plant supplying baseload electricity.

9.2.3.8 Other Biomass-Derived Fuels

In addition to wood and municipal solid-waste fuel, several other biomass-derived fuels are available for fueling electric generators, including burning crops, converting crops to a liquid fuel such as ethanol, and gasifying crops (including wood waste).

The EIA estimates that biomass will be a significant source of renewable electricity generation among the non-hydropower renewable fuels through 2035 (second to wind), and that growth in biomass-based generation capacity is expected in regions with stringent REPS requirements and limited supplies of lower cost resources such as wind (DOE/EIA 2011). Significant biomass resources are available in both North Carolina and South Carolina in the form of woody residues and crop-based biomass, and are expected to contribute to the overall production of energy and fuels in the future. Further, both states have created biomass councils through their respective state energy offices. South Carolina has created a biomass council through its South Carolina Energy Office to capitalize on increasing energy diversity and enhancing environmental quality for South Carolina (South Carolina Energy Office 2007). Additionally, the NCUC, under the REPS program, has defined biomass as a “renewable energy resource,” which also includes solar, wind, and additional non-fossil-based fuel sources, and expects that biomass will be part of future capacity within the state (Duke 2012a). In its 2012 IRP (Duke 2012a), Duke has reduced its expectations for growth in biomass sources while increasing its expectations for growth in solar and wind resources. This shift was driven primarily by decreasing costs and increasing proposals for solar facilities in the region.

Co-firing biomass with coal is possible when low-cost biomass resources are available. Co-firing biomass has been successfully demonstrated in most iterations of boiler technologies, can reduce emissions from coal-only-fired power plants, and is the most economically viable option for near-term introduction of new biomass power generation (DOE 2011a). However, the practice of co-firing does not increase capacity.

In addition to wood and municipal solid-waste fuel, several other biomass-derived fuels are available for fueling electric generators. These include, but are not limited to, animal-derived wastes, crop-based biomass, converting crops to a liquid fuel such as ethanol, and gasifying crops (including wood waste). In compliance with the North Carolina REPS provisions, Duke has pursued energy or energy credits through set-aside agreements or as part of its general requirements (Duke 2012a).

Construction of a biomass-fired plant would have an environmental impact similar to a coal-fired plant, although facilities using wood waste and agricultural residues for fuel would be built on smaller scales. Like coal-fired plants, biomass-fired plants require areas for fuel storage, processing, and waste (e.g., ash) disposal. In addition, operation of biomass-fired plants has environmental impacts, including potential aquatic ecology and air-quality impacts.

Given the limited capacity of the plants, the review team concludes that biomass-derived, or biomass co-fired fuels used singly or in combination with other fossil fuels is not a reasonable alternative to construction and operation of a 2200-MW(e) nuclear power plant supplying baseload electricity.

9.2.3.9 Fuel Cells

Fuel cells work without combustion and its associated environmental side effects. Power is produced electrochemically by passing a hydrogen-rich fuel over an anode, air over a cathode, and then separating the two by an electrolyte. The only byproducts are heat, water, and CO_2. Hydrogen is typically derived from hydrocarbon-based fuels by subjecting them to steam reforming or partial oxidation, or through the electrolysis of water. Natural gas is commonly used as a primary source of hydrogen.

Phosphoric acid fuel cells are generally considered first-generation technology. During the past three decades, significant efforts have been made to develop more practical and affordable fuel cell designs for stationary power applications and the first-generation technologies have given way to membrane- and solid-oxide-based fuel cells operating consistently above 50 percent electrical efficiency (DOE 2010b). High-temperature, second-generation fuel cells have achieved increased fuel-to-electricity and thermal efficiencies. This enables second-generation fuel cell systems to produce both electricity and generate steam such as in distributed generation type combined heat and power applications.

Research in both stationary and transportation-based fuel cells is intended to provide continuing improvements of both materials and components as they relate to system cost and durability. Currently, the cost of fuel cell power systems must be reduced before they can be competitive with conventional technologies (DOE 2011b). At the present time, fuel cells are not economically or technologically competitive with other alternatives for baseload electricity generation (NRC 2008h). Because fuel cells have not been developed to the point where they are capable of supplying power consistent with the proposed project purpose and need, which is equal to 2200 MW(e), the review team concludes that fuel cell-based electricity generation is not a reasonable alternative to construction and operation of a 2200-MW(e) nuclear power plant supplying baseload electricity.

9.2.4 Combinations of Alternatives

Individual alternatives to the construction of one or more new nuclear units at the proposed site might not be sufficient on their own to generate Duke's target value of 2200 MW(e) because of the small size of the resource or lack of cost-effective opportunities. It is conceivable, however, that a combination of alternatives might be capable of meeting both the baseload and capacity targets of proposed project. There are many possible combinations of alternatives. It would not be reasonable to examine every possible combination of energy alternatives in an EIS. Doing so would be counter to CEQ's direction that an EIS should be analytic rather than encyclopedic, shall be kept concise, and shall be no longer than absolutely necessary to comply with NEPA and CEQ's regulations (40 CFR 1502.2(a)(c)). Given that the stated objective is for a baseload power-generation facility of significant capacity, a fossil energy source, most likely coal or natural gas, would need to be a significant contributor to any reasonable alternative energy combination. Accordingly, the following evaluation has a significant capacity contribution from NGCC power plants as part of the combination of alternatives due to its overall lower overall environmental impact when compared to a similar capacity of coal-fired power generation. The evaluation is conducted using 2024 as the target date for implementation acknowledging that the capacity must be capable of displacing the proposed project in that timeframe.

The selection of combined alternatives is reflective of capacity resources determined to be within the proposed region, or supported through review and analysis of programmatic goals of the applicant, regional, or State policies. The review team also considered that Duke has indicated it is aggressively pursuing renewable energy capacity resources and that the likelihood of growth in this capacity area may be limited beyond the growth that Duke is already planning.

In proposing the capacity from a combination of alternatives, the review team first considered which resource portfolio(s) Duke had presented to the utility commission in the State of North Carolina and South Carolina via the 2012 IRP. Additionally, the review team considered State and regional programs and policies for the development of renewable resources, such as the North Carolina REPS, and prior investigations into the availability and potential for development of alternative energy resources such as the *Analysis of Renewable Energy Potential in South Carolina* (LaCapra Associates 2007), and the *Analysis of a Renewable Portfolio Standard for the State of North Carolina* (LaCapra Associates 2006). The following combination of alternatives reflects capacity that can either be reliably delivered to the power system, or would enable an empiric reduction in the need for additional capacity as would be the case for deployed EE programs. The review team also noted that these resources would be required to directly replace the proposed project, and would necessarily be offered as additions to those resources already presented in the 2012 IRP. As such, any new proposed combination of alternatives would need to meet the capacity projections of the proposed project which are estimated to be approximately 17,345 GWh annually; derived from a 2200-MW(e) nuclear power plant operating at a 90 percent capacity factor.

For the combination of energy alternatives, the staff assumes further expansion of EE programs that will add 616 MW(e) of additional energy savings between 2012 and 2024. The 616 MW(e) of new energy efficiency programs is the difference between what is currently provided in the Duke 2012 IRP forecast for new EE programs of 785 MW(e) in 2024, and the "High EE Case" which offers 1401 MW(e) of new energy efficiency programs in 2024 (Duke 2012a). Because the High EE Case was considered by Duke as part of its IRP, it is reasonable to conclude that the implementation of these programs is possible although it is not being executed at this time. For the purposes of this analysis, it is assumed that 100 percent of the impact of the EE programs would be observed leading to a reduction in energy requirements of 5396 GWh annually.

The Duke 2012 IRP also projects the addition of 2820 MW of gas-fired generation, 341 MW of wind, 719 MW of solar, and 141 MW of biomass between 2012 and 2023, for a total of 4021 MW installed capacity. For the combination of alternatives, the staff assumes that further capacity additions would be made in the same ratios. For the renewable sources, this yields additions of 129 MW(e) of wind, 271 MW(e) of solar, and 53 MW(e) of biomass, for a total of 453 MW(e).

The selected combination of alternatives is consistent with the supply portfolio evaluated in the Duke 2012 IRP (Duke 2012a), represented predominantly by new renewable energy resources, new EE implementation, and new baseload-capable power plants noting that new DSM programs are not included because they are not recognized by the State of North Carolina as meeting the REPS requirements. The review team makes no assumptions regarding how the capacity is developed (either through self-build or purchase), transmitted, or distributed, and rather focuses on resource availability and plausibility.

The review team then considered how much energy might be produced from the additional 453 MW(e) of renewable energy sources, recognizing that the additional capacity is weighted toward resources with lower capacity factors (i.e., wind and solar). Considering the capacity factors, the review team determined that the additional renewable energy alternatives could produce approximately 1326 GWh.

The remainder of the energy required would be expected to come from NGCC given its lower environmental impact compared to other fossil-based facilities. The total energy required from

NGCC would therefore be equal to 10,623 GWh representing the difference between the proposed project and the other resources (EE and renewable energy):

Proposed project:	17,345 GWh
Energy Efficiency:	-5396 GWh
Renewables:	-1326 GWh
NGCC	10,623 GWh

The NGCC units would provide a portion of the baseload power and also make up for any shortfall in power generation when the intermittent sources (wind and solar) are not generating at full capacity. The EE component of this alternative acts like baseload capacity, and the biomass component operates as a baseload source. Subtracting these two components from the 2200 MW(e) intended for the nuclear units, leaves roughly 1530 MW(e) as the installed capacity of the NGCC units. Using NGCC as a baseload alternative capable of high capacity factors, the review team determined that the 10,623 GWh could be satisfied by three NGCC facilities of approximately 510 MW(e) each, operating at an average capacity factor of about 79 percent. In reducing the energy delivered by the NGCC plant by approximately 39 percent from that presented in Section 9.2.2.2, the review team acknowledges that Make-Up Pond C may not be required to support this level of generating capacity at the Lee Nuclear Station site. However, the review team considered that environmental impacts are likely to be noticeable for land-use and ecology impact categories due to the significant build-out of renewable energy sources as well as any remaining biomass-based capacity resources, which would not be co-located at the Lee Nuclear Station site.

For a combination of alternative energy sources, the review team assessed the potential environmental impacts of increasing EE over 78 percent, and increasing the renewable portfolio by more than 35 percent over that which is already offered in the Duke 2012 IRP (Duke 2012a) for 2024. Additionally, the review team considered the environmental impacts of using NGCC to provide the remainder of the energy required. A summary of the environmental impacts associated with the construction and operation of this combination of alternatives is found in the following Table 9-3.

Table 9-3. Summary of Environmental Impacts of a Combination of Power Sources

Impact Category	Impact	Comment
Land use	MODERATE	Natural gas-fired power plants would have land-use impacts for the power block, new transmission-line rights-of-way, cooling towers and support systems, and connection to a natural-gas pipeline. Land would be required for even a smaller version of Make-Up Pond C. Significant build-out of renewable energy resources would require facilities, fuel production and harvesting, and associated transmission lines that would have noticeable land-use impacts.

Table 9-3. (contd)

Impact Category	Impact	Comment
Air quality	SMALL to MODERATE	Based on the difference in energy generated, emissions from natural-gas-fired capacity are 61 percent of that considered in Section 9.2.2.2, and would be approximately: SO_2 – 19 T/yr NO_x – 334 T/yr CO – 127 T/yr PM_{10} – 64 T/yr CO_2 – 3,717,000 T/yr. The combustion of biomass and/or other solid wastes would have emissions. In consideration of EPA regulations regarding PSD permitting, the preceding emissions would be regulated as a "major" new source and are therefore a MODERATE impact for those constituents.
Water use and quality	SMALL	Impacts would be comparable to the impacts for a new nuclear power plant located at the proposed site.
Ecology	MODERATE	Many of the onsite impacts would occur in areas that were previously disturbed during the construction of the Cherokee Nuclear Station. Thus, potential habitat loss and fragmentation and reduced productivity and biological diversity would likely be minimal at the site, but would likely increase dependent on the siting, construction, and operation of biomass, wind, and other renewable energy sources, which would not be co-located on the site.
Waste management	SMALL	Waste would be produced from spent SCR catalyst used for control of NO_x emissions, and ash and slag from biomass and municipal solid-waste sources.
Socioeconomics	MODERATE (adverse) to MODERATE (beneficial)	Construction and operations workforces would be relatively small because of the reliance upon natural-gas generation. Additions to the local tax base, while smaller than for a nuclear or coal-fired plant, might still be noticeable. Some construction-related impacts would be noticeable. Impacts during operation would be minor because of the small workforce involved. The significant build-out of renewable power-generation facilities and the associated transmission lines would have aesthetic impacts.
Human health	SMALL	Regulatory controls and oversight would be protective of human health.
Historic and cultural resources	MODERATE	Most of the facilities and infrastructure at the site would likely be built on previously disturbed ground. Impacts resulting from ground-disturbance and visual intrusions would likely increase dependent on the siting, construction, and operation of renewable power-generation facilities, which would not be co-located on the site.

Table 9-3. (contd)

Impact Category	Impact	Comment
Environmental justice	SMALL	The review team identified no pathways by which a disproportionately high and adverse impact could be imposed upon any minority or low-income populations within the 50-mi region.

9.2.5 Summary Comparison of Energy Alternatives

Table 9-4 contains a summary of the review team's environmental impact characterizations for constructing and operating new nuclear, coal-fired, and natural-gas-fired combined-cycle units at the proposed site. The combination of alternatives shown in Table 9-4 assumes siting of natural-gas-fired, combined-cycle units at the proposed site and the siting of other generating units in the general vicinity (within 100 mi) of the site, or as locations mandate. Closed-cycle cooling with natural draft or mechanical cooling towers is assumed for all thermal plants.

Table 9-4. Summary of Environmental Impacts of Construction and Operation of New Nuclear, Coal-Fired, and Natural-Gas-Fired Generating Units, and a Combination of Alternatives

Impact Category	Nuclear[a]	Coal	Natural Gas	Combination of Alternatives
Air quality	SMALL	MODERATE	SMALL to MODERATE	SMALL to MODERATE
Waste management	SMALL	MODERATE	SMALL	SMALL
Human health	SMALL	SMALL	SMALL	SMALL
Land use	MODERATE	MODERATE	MODERATE	MODERATE
Water use and quality	SMALL	SMALL	SMALL	SMALL
Ecology	MODERATE	MODERATE	MODERATE	MODERATE
Socioeconomics	MODERATE (adverse) to LARGE (beneficial)	MODERATE (adverse) to LARGE (beneficial)	MODERATE (adverse) to MODERATE (beneficial)	MODERATE (adverse) to MODERATE (beneficial)
Historic and cultural resources	MODERATE	MODERATE	MODERATE	MODERATE
Environmental justice	SMALL	SMALL	SMALL	SMALL

(a) For nuclear, conclusion reflects conclusions presented in Chapters 4 and 5, and Sections 6.1 and 6.2.

The distinguishing impacts are primarily related to emissions from the alternative generation sources (air quality). For the energy-generation alternatives discussion, emissions are bounded by a review of criteria pollutants and the total tons produced. Accordingly, the coal-fired alternative produces the highest level of criteria pollutants and total air emissions; in total tons, the highest percentage of regulated emissions comes from the release of sulfur during the combustion process followed by NO_X and CO also due to the combustion of coal with air (oxygen). These pollutants can also lead to the development of PM. The natural-gas-fired alternative produces the next highest level of emissions. With a reasonably clean fuel stream (methane), the primary pollutants are limited to NO_X and CO. Natural gas in combination with renewable resources emits lower quantities of criteria pollutants than the natural-gas-fired alternative. A nuclear plant has less impact on air quality than coal, natural gas, or a combination of alternatives.

With respect to other resource areas, the coal alternative has a greater waste impact than the other alternatives. The nuclear and coal plant alternative provides the greatest economic benefits to Cherokee County. While the natural-gas alternative has the least adverse socioeconomic impact for the plant itself, considering the construction and operation of transmission lines, the impacts on aesthetics are similar to coal and nuclear alternatives. Overall, the review team concludes that none of the energy alternatives is environmentally preferable to the proposed Lee Nuclear Station.

It is appropriate to specifically discuss the differences among the alternative energy sources regarding CO_2 emissions. The CO_2 emissions for the proposed action and energy-generation alternatives are discussed in Sections 5.7.2, 9.2.2.1, 9.2.2.2, and 9.2.4. Table 9-5 summarizes the CO_2 emission estimates for a 40-year period for the alternatives considered by the review team to be viable for baseload power generation. These estimates are limited to the emissions from power generation and do not include CO_2 emissions for workforce transportation, construction, fuel cycle, or decommissioning. Among the viable energy-generation alternatives, the CO_2 emissions for nuclear power are a small fraction of the emissions of the other viable energy-generation alternatives.

Table 9-5. Comparison of Direct Carbon Dioxide Emissions for Energy Alternatives

Generation Type	Years	CO_2 Emission (MT)
Nuclear power[a]	40	380,000
Coal-fired generation[b]	40	760,000,000
Natural-gas-fired generation[c]	40	243,000,000
Combination of alternatives[d]	40	149,000,000

(a) From Section 5.7.2, value is for two units.
(b) From Section 9.2.2.1.
(c) From Section 9.2.2.2.
(d) From Section 9.2.4 (assuming only natural-gas generation has significant CO_2 emissions).

On June 3, 2010, the EPA issued a rule tailoring the applicability criteria that determines which stationary sources and modifications to existing projects become subject to permitting requirements for greenhouse gas emissions under the PSD and Title V programs of the Clean Air Act (Ref 75 FR 31514). According to the Tailoring Rule, greenhouse gas is a regulated new source review (NSR) pollutant under the PSD major source permitting program if the source (1) is otherwise subject to PSD (for another regulated NSR pollutant) and (2) has a greenhouse gas potential to emit equal to or greater than 75,000 T/yr of carbon dioxide equivalent (CO_2e) (adjusting for different global warming potentials for different greenhouse gases). Such sources would be subject to BACT. The use of BACT has the potential to reduce the amount of greenhouse gases emitted from stationary source facilities. The implementation of this rule could reduce the amount of greenhouse gases from the values indicated in Table 9-5 for coal and natural gas, as well as from other alternative energy sources that would otherwise have appreciable uncontrolled greenhouse gas emissions. The emission of greenhouse gases from the production of electrical energy from a nuclear power source is multiple orders of magnitude less than those of the reasonable alternative energy sources. Accordingly, the comparative relationship between the energy sources listed in Table 9-5 would not change meaningfully because greenhouse gas emissions from the other energy source alternatives would not be sufficiently reduced to make them environmentally preferable to the proposed project.

Considering the addition of life-cycle greenhouse gas emissions from the production of electricity from a nuclear power source, i.e., those from the fuel cycle and transportation of workers, total emissions for plant operation over a 40-year period would increase to about 54,000,000 MT. This amount is still significantly lower than the emissions from any of the other alternatives; such emissions could be reduced further if the electricity from the assumed fossil fuel source powering the fuel cycle is subject to BACT controls.

CO_2 emissions associated with generation alternatives such as wind power, solar power, and hydropower would be associated with workforce transportation, construction, and decommissioning of the facilities. Because these generation alternatives do not involve combustion, the review team considers the emissions to be minor and concludes that the emissions would have a minimal impact. Other energy-generation alternatives involving combustion of oil, wood waste, municipal solid waste, or biomass-derived fuels would have CO_2 emissions from combustion as well as from workforce transportation, plant construction, and plant decommissioning. It is likely that the CO_2 emissions from the combustion process for these alternatives would dominate the other CO_2 emissions associated with the generation alternative. It is also likely that the CO_2 emissions from these alternatives would be the same order of magnitude as the emissions for the fossil fuel alternatives considered in Sections 9.2.2.1 and 9.2.2.2. However, because these alternatives were determined by the review team not to meet the need for baseload power generation, the review team has not evaluated the CO_2 emissions quantitatively.

As discussed in Chapter 8 of this EIS, the review team has concluded that the need for the additional baseload power generation has been demonstrated. Also, as discussed earlier in this chapter, the review team concludes that the viable alternatives to the proposed action all would involve the use of fossil fuels (coal or natural gas) whether singly or in combination with other alternative energy resources. The review team concludes that the proposed action results in the lowest level of emissions of greenhouse gases among the viable alternatives.

9.3 Alternative Sites

The NRC's ESRP (NRC 2000a) states that the environmental report (ER), submitted in conjunction with an application for a COL, should include an evaluation of alternative sites to determine if any obviously superior alternative to the proposed site exists. The NRC's site-selection process guidance calls for identification of a ROI, followed by successive screening to identify candidate areas, potential sites, candidate sites, and the proposed site (NRC 2000a). This section includes a discussion of Duke's ROI for the proposed siting of a new nuclear power plant, and describes its alternative site-selection process. This is followed by the review team's evaluation of the Duke process, a description of the alternative sites selected, and discussion of the environmental impacts of locating the proposed facilities at each alternative site.

The review of alternative sites consists of a two-part sequential test (NRC 2000a). The first part of the test determines whether any of the alternative sites are environmentally preferable. To determine if a site is environmentally preferable, the review team considers whether the applicant has (1) reasonably identified candidate sites, (2) evaluated the likely environmental impacts of the proposed action at these sites, and (3) used a logical means of comparing sites that led to selection of the proposed site. Based on its independent review, the review team determines whether any of the alternative sites are environmentally preferable to the applicant's proposed site. If the review team determines that one or more alternative sites are environmentally preferable, it then proceeds with the second part of the test.

The second part of the test determines if an environmentally preferable alternative site is not simply marginally better, but obviously superior to the proposed site. The review team examines whether (1) one or more important aspects, either singly or in combination, of an acceptable and available alternative site are obviously superior to the corresponding aspects of the applicant's proposed site, and (2) the alternative site does not have offsetting deficiencies in other important areas. Included in this part of the test is the consideration of estimated costs (i.e., environmental, economic, and time of building the proposed plant) at the proposed site and at the environmentally preferable site or sites (NRC 2000a).

This section describes Duke's site-selection process, the review team's evaluation of the Duke process, the alternative sites selected by Duke, and the review team's evaluation of the environmental impacts of locating two new nuclear generating units at each alternative site.

The specific resources and components that could be affected by the incremental effects of the proposed action and other actions in the same geographic area were assessed. For the purposes of this alternative sites evaluation, impacts evaluated include NRC-authorized construction, operation, and other cumulative impacts including preconstruction activities. Sections 9.3.3 through 9.3.5 provide a site-specific description of the environmental impacts at each alternative site based on issues such as land use, water resources, terrestrial and aquatic ecology, socioeconomics, environmental justice, historic and cultural resources, air quality, nonradiological health, radiological impacts of normal operation, and postulated accidents. Section 9.3.6 contains a table of the review team's characterization of the impacts at the alternative sites and comparison with the proposed site to determine if there are any alternative sites that are environmentally preferable to the proposed site.

9.3.1 Alternative Site-Selection Process

Duke used guidance provided in the NRC's ESRP (NRC 2000a), NRC Regulatory Guide 4.7, Revision 2 (NRC 1998), and the Electric Power Research Institute Siting Guide (EPRI 2002). The site-selection and comparison process focused on identifying and evaluating sites that represented an acceptable range of alternatives for the proposed Lee Nuclear Station Units 1 and 2. The following information details the process deployed to strategically identify and screen sites in successive steps until a reasonable number of alternative sites were determined and evaluated, and the proposed Lee Nuclear Station site was selected (Duke 2009c).

Duke's screening process proceeded through the following steps, which successively reduced the number of sites down to the final candidate sites (Duke 2009c):

- ROI: Largest geographic area of consideration generally defined as either the State in which the applicant proposes to build, or the relevant service area of the applicant.
- Candidate Areas: Areas within the ROI that would support the facility as proposed. These areas were determined by using exclusionary and/or avoidance criteria to screen the ROI to eliminate those areas where it would not be feasible to site a nuclear facility due to regulatory, institutional, plant design, and/or significant environmental impacts.
- Potential Sites: Discrete parcels of land found within the candidate areas that would support the facility as proposed. Potential sites were determined by using a refined set of exclusionary and/or avoidance criteria to screen the candidate areas. The screening data set was more refined and of higher detail than the data set used to identify the candidate areas.
- Candidate Sites: Sites that were selected by applying suitability criteria to the potential site list. This selection process used a quantifiable weighting and ranking process, including sensitivity analysis.
- Proposed Site(s): Identification of the proposed site from the list of candidate sites was done on an issue-by-issue basis that allowed the applicant to identify both cost and

environmental trade-offs associated with developing each of the candidate sites. This approach provided a high level of assurance that the proposed site had no fatal flaw that could result in environmental impacts outside the identified scope, licensing delays, or increased cost.

The identification and validation of the final proposed site was done on an issue-by-issue basis, allowing the applicant to identify the cost and environmental trade-offs associated with developing each one of the candidate sites (Duke 2009c).

ESRP 9.3 (NRC 2000a) recognizes the potential value of including existing nuclear power plant sites that were "previously found acceptable on the basis of a National Environmental Policy Act (NEPA) review, or have [been] demonstrated to be environmentally acceptable on the basis of operating experience, or allocated to an applicant by a state government from a list of state-approved power plant sites." Of the four final candidate sites, both the Lee Nuclear Station site (former Cherokee Nuclear Station site) and Perkins site met the preceding criteria of having been found previously acceptable after a NEPA review. The review team notes that previous determinations of site acceptability do not exempt that site from the same level of rigor of evaluation applied to the other alternative sites. The ESRP simply recognizes that a significant level of site characterization may have already been conducted thereby providing a reasonable basis for assessment.

To aid in the screening and evaluation of alternative sites, several Duke business-specific considerations were evaluated and incorporated into the siting analysis as "bounding conditions". They include the following:

- The alternative sites must be suitable for design parameters of the specific reactor and plant design as certified by the NRC; sites should be identified in both North Carolina and South Carolina that are suitable for nuclear power plants.
- The location must be compatible with Duke's current transmission capabilities, and provide baseload power to the primary load centers in the Duke ROI with minimal loss.
- The selected sites' expected characterization, licensing, and regulatory potential must minimize schedule and financial risk.
- Compliance with all NRC and other requirements.

As a regulated utility with a franchised service area, Duke defined its ROI as consisting of its franchised service area, which is consistent with the guidance in the NRC's ESRP (NRC 2000a). The review team concludes that the ROI used in Duke's application is reasonable for consideration and analysis of candidate areas and sites. The review team also finds that Duke's basis for defining its ROI did not arbitrarily exclude or include desirable locations.

Duke screened the ROI using applicable exclusionary and avoidance criteria, as identified in the Electric Power Research Institute's Siting Guide (EPRI 2002). Using the following seven criteria: seismic/geology, population density, water availability, dedicated land use, regional ecological features, proximity to high-voltage transmission and load centers, and access to rail lines; Duke's initial screening yielded six candidate areas, which included two in North Carolina, three in South Carolina, and one that extended across both States. Figure 9-1 shows the ROI and the six candidate areas (termed "Regional Screening Areas" in the figure).

To identify potential sites from within the candidate areas, Duke deployed a two-track process. In the first track, Duke reviewed previous siting studies completed for both nuclear and fossil-fuel plants within the candidate areas. Seventeen total potential sites were identified within the candidate areas; the list included the three nuclear power stations owned and operated by Duke: Catawba Nuclear Station, Oconee Nuclear Station, and McGuire Nuclear Station. Due to site-specific land-use restrictions, expanding population growth, and/or additional challenges, all three sites were dropped from further consideration. However, a potential site adjacent to the Oconee Nuclear Station (termed the Keowee site) was identified through application of rough-screening criteria that capitalized on aspects of being located in close proximity to a nuclear station, though not physically co-located. This provided 15 total potential sites. Five sites were screened out due to significant residential development in the area, reducing the list to 10 potential sites.

The second track was a secondary and completely discrete siting exercise using a geographic basis to evaluate the candidate areas for potential sites. This siting activity applied criteria such as population and development avoidance; proximity to transportation, transmission, and load centers; diversity among sites representing both South Carolina and North Carolina; and maintaining as available, one potential site for each major water source. Thirteen potential sites were identified in this independent activity. The 13 potential sites were consolidated with the 10 potential sites identified by Duke in its previous siting analysis. Eight of the 23 combined list sites were duplicates, which left a final list of 15 potential sites for continued evaluation.

A two-phase process involving coarse screening followed by fine screening was then used to evaluate the 15 potential sites. In the first (coarse) evaluation, the 15 potential sites were assessed against 9 coarse screening criteria by assigning weighting and ranking factors to each site in 9 key criteria areas, including 6 environmental criteria and 3 cost criteria. The nine coarse screening criteria included water supply availability, flooding potential, distance to population centers, known hazardous land uses near the site, protected species or habitat near the site, acres of identified wetlands on the site, cost to construct access to nearest rail line, cost to construct transmission to nearest transmission node, and land acquisition costs. This evaluation provided a composite score for each site reflective of overall suitability. A total of seven potential sites were carried forward for fine screening.

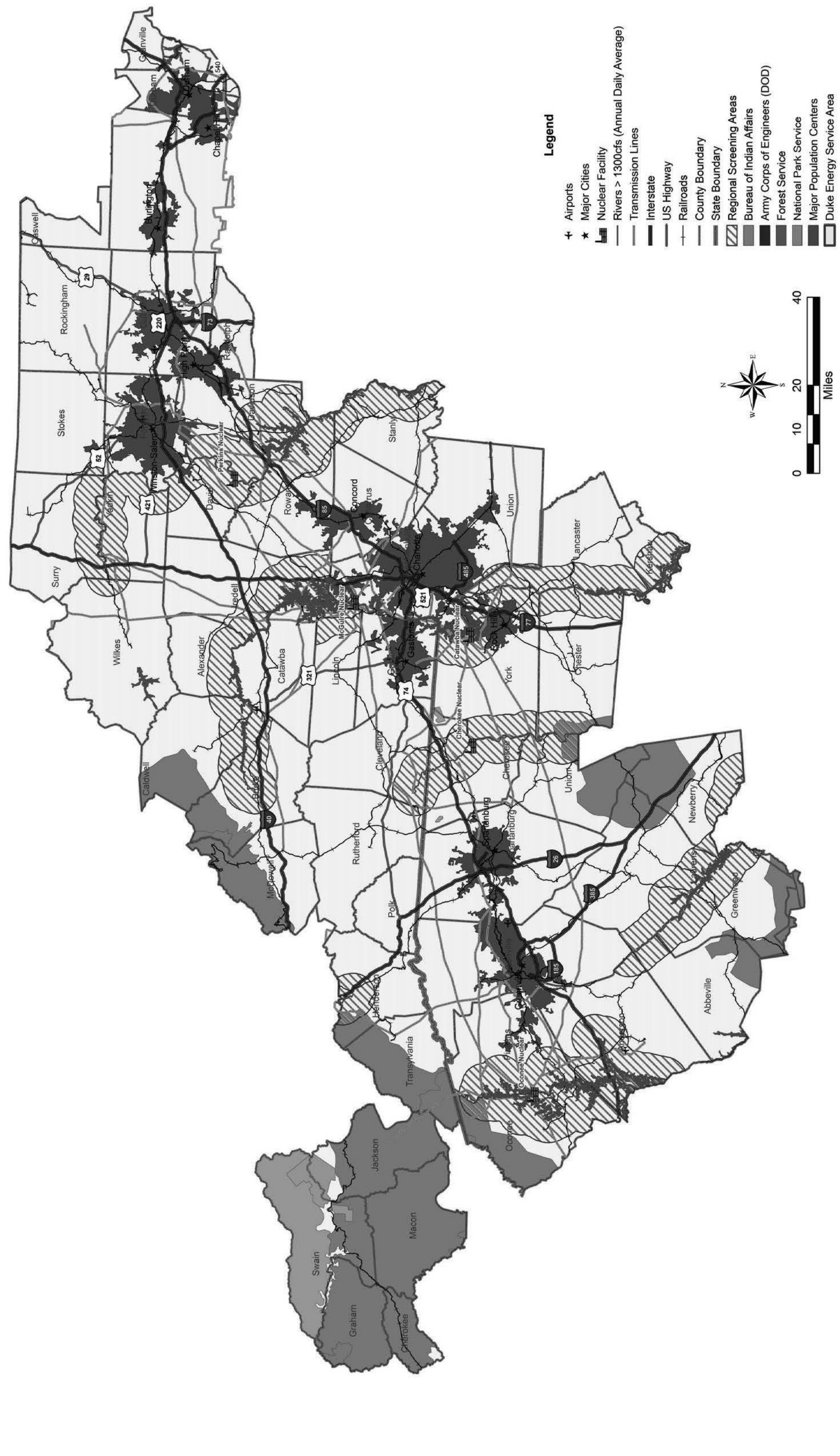

Figure 9-1. Duke ROI Showing Regional Screening Results (Duke 2009c, Figure 9.3-3)

In the second (fine) evaluation, the remaining seven potential sites were then assessed against fine screening criteria using an expanded set of over 40 site-specific suitability criteria. The detailed evaluation and final composite scores of the seven remaining potential sites yielded a quantified evaluation that enabled the selection of the final proposed site and three alternative sites.

Using the process described above, Duke identified the Lee Nuclear Station site as its proposed site along with three alternative sites for detailed comparative evaluation, including (Duke 2009c):

- Perkins site (previously considered for the Perkins Nuclear Station), Davie County, North Carolina
- Keowee site (adjacent to Oconee Nuclear Station), Oconee County, South Carolina
- Middleton Shoals site, Anderson County, South Carolina.

Of the three alternative sites, all are greenfield sites. One, the Perkins site, was previously characterized for the siting of a nuclear power plant that was never built. In the final application of screening criteria, Duke considered aspects of both environmental impact and cost. The review team considered only environmental matters in its determination of whether an alternative site was environmentally preferable to the proposed site and did not consider non-environmental issues, such as constructability and cost. The review team recognizes, however, that in some cases environmental and cost factors are related. So, for example, a site that requires longer transmission lines will have both higher environmental impacts and higher costs related to those transmission lines.

9.3.2 Review Team Evaluation of Duke's Alternative Sites

The review team evaluated the methodology used by Duke and concluded that the process was reasonable and consistent with the guidelines presented in the ESRP and the EPRI Siting Guide. The review team found that the systematic alternative siting analysis demonstrated a logical selection process and application of screening and exclusionary siting criteria. The analysis enabled the evaluation of the likely environmental impacts associated with the respective sites, including the evaluation of suitability criteria; identified acceptable alternative sites; and clearly provided the mechanism for selection of the final proposed site.

Following the guidance provided in ESRP 9.3 (NRC 2000a), the review team visited the three alternative sites and collected and analyzed reconnaissance-level information for each. The review team then used the information in the ER and responses to requests for additional information (RAIs), information from other Federal and State agencies, and information gathered during the site visits to evaluate environmental impacts of building and operating two new nuclear power plants at those sites. The analysis considered the impacts of

NRC-authorized construction and operation as well as potential cumulative impacts associated with other actions affecting the same resources, including but not limited to preconstruction. The cumulative impact analysis for the alternative sites was performed in the same manner as discussed in Chapter 7 for the proposed site except, as specified in ESRP 9.3 (NRC 2000a), the analysis was conducted at the reconnaissance level. The review team researched EPA databases for recent EISs within the State; used an EPA database for permits for water discharges in the geographic area to identify water-use projects; and used www.recovery.gov to identify projects in the geographic area funded by the American Recovery and Reinvestment Act of 2009 (ARRA). The review team developed tables of the major projects near each alternative site that were considered relevant in the cumulative analysis. The review team used the information to perform an independent evaluation of the direct, indirect, and cumulative impacts of the action at the alternative sites to determine if one or more of the alternative sites were environmentally preferable to the proposed site.

Included are past, present, and reasonably foreseeable Federal, non-Federal, and private actions that could have meaningful cumulative impacts with the action. For the purposes of this analysis, the past is defined as the time period prior to receipt of the COL application. The present is defined as the time period from the receipt of the COL application until the beginning of NRC-authorized construction of proposed Units 1 and 2. Future actions are those that are reasonably foreseeable through NRC-authorized construction and operation of the proposed Units 1 and 2 and decommissioning.

The specific resources and components that could be affected incrementally by the action and other actions in the same geographic area were identified. The affected environment that serves as the baseline for the cumulative impacts analysis is described for each alternative site, and a qualitative discussion of the general effects of past actions is included. The geographic area over which past, present, and future actions could reasonably contribute to cumulative impacts is defined and described for each resource area. The analysis for each resource area at each alternative site concludes with a cumulative impact finding (SMALL, MODERATE, or LARGE). For conclusions greater than SMALL, the review team also discussed whether building and operating the proposed facilities would be a significant contributor to the cumulative impact. In the context of this evaluation, “significant” is defined as a contribution that is important in reaching that impact-level determination.

The nonradiological waste impacts described in Sections 4.10 and 5.10 would not substantially vary from one site to another. The types and quantities of nonradiological and mixed waste would be approximately the same for construction and operation of two Westinghouse Advanced Passive 1000 (AP1000) pressurized water reactors at any of the alternative sites. For each alternative site, all wastes destined for land-based treatment or disposal would be transported offsite by licensed contractors to existing, licensed, disposal facilities operating in compliance with all applicable Federal, State, and local requirements. All nonradioactive, liquid discharges would be discharged in compliance with the provisions of the applicable NPDES permit. For these reasons, these impacts are expected to be minimal and will not be discussed separately in the evaluation of each alternative site.

The impacts described in Chapter 6 of this EIS (e.g., nuclear fuel cycle and decommissioning) would likewise not substantially vary from one site to another. This is true because all of the sites are in low-population areas and because the review team assumes the same reactor design (therefore, the same fuel-cycle technology, transportation methods, and decommissioning methods) for all of the sites. As such, these impacts would not differentiate between the sites and would not be useful in the determination of whether an alternative site is environmentally preferable to the proposed site. For this reason, these impacts are not discussed in the evaluation of the alternative sites.

The cumulative impacts are summarized for each resource area in the subsections that follow. The level of detail is commensurate with the potential significance of the impacts. The three alternative sites are described in the following sections: the Perkins site (9.3.3); the Keowee site (9.3.4); and the Middleton Shoals site (9.3.5). A summary comparison of the review team's characterization of the impacts of the proposed action at the proposed and alternative sites is presented in Section 9.3.6 and Table 9-18.

9.3.3 The Perkins Site

This section covers the review team's evaluation of the potential environmental impacts of siting two new nuclear units at the Perkins site located in Davie County, North Carolina. The site was characterized in detail for the Perkins Nuclear Station (Duke Power Company 1974d). The following sections describe a cumulative impact assessment conducted for each major resource area. The specific resources and components that could be affected by the incremental effects of the proposed action if it were implemented at the Perkins site, and other actions in the same geographic area were considered. This assessment includes the impacts of NRC-authorized construction, operations, and preconstruction activities. Also included in the assessment are other past, present, and reasonably foreseeable Federal, non-Federal, and private actions that could have meaningful cumulative impacts when considered together with the proposed action if implemented at the Perkins site. Other actions and projects considered in this cumulative analysis are described in Table 9-6.

Perkins is a wooded greenfield site located approximately 11 mi north of Salisbury, North Carolina. The Perkins site is wholly owned by Duke, and is maintained as forested land under the direct management of the North Carolina Wildlife Resources Commission. As an undeveloped greenfield site, the site would require significant grading and cut-fill activities to support a two-unit nuclear power facility. Figure 9-2 shows the Perkins site region.

The Perkins site is located in the northeast portion of Duke's service territory in close proximity to U.S. Highways 158 (US-158), US-64, and US-601. Route 801 provides the approximate northern boundary to the site, and the Yadkin River provides portions of the approximate southern boundary. Interstate 85 (I-85) lies approximately 9 mi southeast of the site. The area is predominantly rural. The nearest population centers are Salisbury, North Carolina, which is approximately 11 mi south of the site and Winston-Salem, North Carolina, which is approximately 15 mi northeast of the site.

Table 9-6. Past, Present, and Reasonably Foreseeable Projects and Other Actions Considered in the Perkins Alternative Site Cumulative Analysis

Project Name	Summary of Project	Location	Status
Nuclear Energy Projects			
Catawba Nuclear Station Units 1 and 2	Nuclear power generating plant with two 1129-MW(e) Westinghouse pressurized water reactors	Approximately 65 mi southwest of the Perkins site	Catawba Units 1 and 2 are currently operational and licensed through December 5, 2043 (NRC 2012a).
H.B. Robinson Unit 2	Nuclear power generating plant with one 710-MW(e) Westinghouse pressurized water reactor	Approximately 100 mi south-southeast of the Perkins site	H.B. Robinson Unit 2 is currently operational and licensed through July 31, 2030 (NRC 2012a).
McGuire Nuclear Station Units 1 and 2	Nuclear power generating plant with two 1100-MW(e) Westinghouse pressurized water reactors	Approximately 40 mi southwest of the Perkins site	McGuire Units 1 and 2 are currently operational and are licensed through June 12, 2041 and March 3, 2043, respectively (NRC 2012a)
Shearon Harris Nuclear Power Plant Unit 1	Nuclear power generating plant with one 900-MW(e) Westinghouse pressurized water reactor	Approximately 85 mi east of the Perkins site	Shearon Harris Unit 1 is currently operational and licensed through October 24, 2046 (NRC 2012a)
Shearon Harris Units 2 and 3	Nuclear power generating plant with two Westinghouse AP1000 pressurized water reactors	Approximately 85 mi east of the Perkins site	Proposed (NRC 2008l)

Table 9-6. (contd)

Project Name	Summary of Project	Location	Status
Coal and Natural Gas Energy Projects			
Buck Steam Station	The 256-MW coal-fired generating plant operated by Duke Energy was permanently shut down in April 2013.	Approximately 10 mi south-southeast of the Perkins site	Ceased operations (Duke 2013d)
Buck Combined-Cycle Station	A 620-MW combined-cycle natural-gas plant on the Buck Steam Station site began operations in 2011.	Approximately 10 mi south-southeast of the Perkins site	Operational (Duke Energy 2013c)
Plant Rowan	A 925-MW natural-gas-fired generating plant operated by Southern Power	Approximately 12 mi southwest of the Perkins site	Operational (Southern Power 2013)
Marshall Steam Station	A 2090-MW coal-fired generating plant operated by Duke Energy	Approximately 34 mi west-southwest of the Perkins site	Operational (Duke Energy 2010h)
Belews Creek Steam Station	A 2240-MW coal-fired generating plant operated by Duke Energy	Approximately 37 mi northwest of the Perkins site	Operational (Duke Energy 2010i)
Riverbend Steam Station	A 454-MW coal-fired generating plant operated by Duke Energy was permanently shut down in March 2013	Approximately 45 mi southwest of the Perkins site	Ceased operations (Duke 2013d)
Rockingham Station	A 825-MW natural-gas-fired plant operated by Duke Energy	Approximately 48 mi northwest of the Perkins site	Operational (Duke Energy 2010k)
Various small-scale fossil and cogeneration generating facilities such as the City of Winston-Salem landfill gas-to-energy project	Fossil-fuel-fired and cogeneration facilities ranging from 1-11 MW	In North Carolina and South Carolina throughout the 50-mi region	Operational (Landfill Energy Systems 2013) and Proposed (NCDENR 2010a)

Table 9-6. (contd)

Project Name	Summary of Project	Location	Status
Hydroelectric Energy Projects			
Yadkin Project	A series of four hydroelectric generating stations including Falls (29.94 MW), Narrows (108.8 MW), Tuckertown (38.04 MW), and High Rock (39.6 MW). Operated by Alcoa Power Generating, Inc.	On the Yadkin River between 21 mi and 38 mi southeast and downstream of the Perkins site	Operational (Alcoa 2010)
Lookout Shoals	A 26-MW hydroelectric plant operated by Duke Energy	Approximately 36 mi west of the Perkins site	Operational (Duke Energy 2010l)
Cowans Ford	A 350-MW hydroelectric plant operated by Duke Energy	Approximately 40 mi southwest of the Perkins site	Operational (Duke Energy 2010m)
Oxford	A 36-MW hydroelectric plant operated by Duke Energy	Approximately 42 mi west of the Perkins site	Operational (Duke Energy 2010n)
Mountain Island	A 60-MW hydroelectric plant operated by Duke Energy	Approximately 46 mi southwest of the Perkins site	Operational (Duke Energy 2010o)
Tillery Hydroelectric Plant	An 86-MW hydroelectric plant operated by Duke Energy	Approximately 49 mi south-southeast of the Perkins site	Operational (Duke Energy 2013d)
Various small-scale hydroelectric projects located on dams, including the Mayo project.	Run-of-river and dam storage hydroelectric projects ranging up to 1.2 MW.	In North Carolina and South Carolina throughout the 50-mi region	Operational (NCDENR 2010b)
Transportation Projects			
Winston-Salem Northern Beltway	Multi-lane freeway that will loop around the northern part of Winston-Salem	Winston-Salem, NC, approximately 14 mi north-northwest of the Perkins site	Proposed (NCDOT 2010)
NC 109 Improvement Project	Improvements to NC 109 from Old Greensboro Road (SR 1798) in Davidson County to I-40/US 311 in Forsyth County.	Winston-Salem, NC, approximately 16 mi northeast of the Perkins site	Proposed (NCDOT 2013)

Table 9-6. (contd)

Project Name	Summary of Project	Location	Status
LYNX Blue Line Extension Northeast Corridor Light Rail Project	An 11-mi-long extension of the light rail system	Charlotte, NC, approximately 39 mi south-southwest of the Perkins site	Proposed (CATS 2010)
Parks and National Forests			
Boone's Cave Park	100-ac park on Yadkin River	Approximately 4 mi south of the Perkins site	Managed by Davidson Co. Recreation and Parks Department (Davidson County 2009)
Tanglewood Park	Fishing ponds, picnic area, gardens, and trails at former estate	Approximately 11 mi north of the Perkins site	Managed by Forsyth County
Uwharrie National Forest	50,645-ac national forest.	Approximately 28 mi southeast of the Perkins site	Currently managed by U.S. Forest Service (USFS 2013)
Other State parks, forests, and wilderness areas	Numerous State Parks, Wildlife Management Areas, and Wilderness Areas including Boone's Cave State Park, Lake Norman State Park, Pilot Mountain State Park, Hanging Rock State Park, and Daniel Boone State Park	Throughout the 50-mi region	Development likely limited in these areas (NCDPR 2010)
Other Actions/Projects			
PPG Industries Fiber Glass Products	Pressed and blown glassware manufacture	Approximately 10 mi southeast of the Perkins site	Operational PPG: (EPA 2010ae)
Arteva Specialties Kosa Salisbury Plant	Plastic manufacture	Approximately 12 mi southwest of the Perkins site	Operational ARTEVA: (EPA 2010af)
Tyson Foods	Animal food processing	Approximately 17 mi northwest of the Perkins site	Operational Tyson: (EPA 2010ag)
Thomasville Furniture Plant	Sawmills and Planing Mills	Approximately 21 mi east of the Perkins site	Operational Thomasville: (EPA 2010ah)

Table 9-6. (contd)

Project Name	Summary of Project	Location	Status
Various hospitals	Medical isotopes	Within 50 mi of the Perkins site	Operational in nearby cities and towns
Surface mines including the Martin Marietta, Carolina Sand Company, Vulcan Materials, and Carolina Quarries	Surface mining operations for construction materials	Various locations within the 50-mi region	Operational Martin Marietta: (EPA 2010ai) Carolina Sand: (EPA 2010aj) Vulcan: (EPA 2010ak) Carolina Quarries: (EPA 2010al)
Minor water dischargers and wastewater-treatment plants	NPDES-permitted municipal and industrial discharges	Throughout the 50-mi region	Operational
Commercial dairies and poultry farms including Spencer Poultry, Beeson Poultry, Hampton Poultry, Mountaire Farms, and Buttke Dairy Enterprises	Commercial production of animal products	In North Carolina and South Carolina throughout the 50-mi region	Operational in surrounding areas
Future Urbanization	Construction of housing units and associated commercial buildings; roads, bridges, and railroad; construction of water- and/or wastewater-treatment and distribution facilities and associated pipelines, as described in local land-use planning documents	Throughout region.	Construction would occur in the future, as described in State and local land-use planning documents

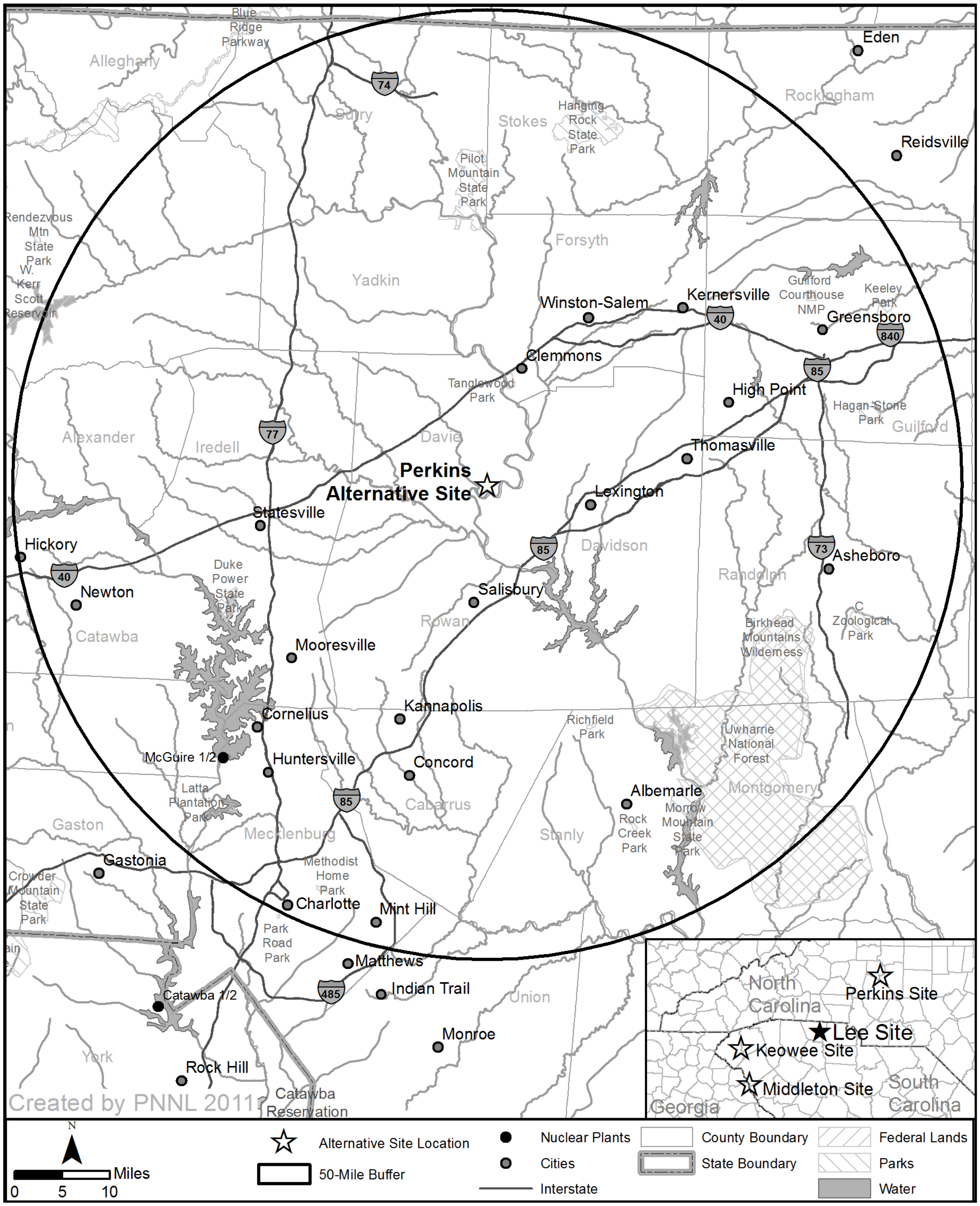

Figure 9-2. The Perkins Site Region

9.3.3.1 Land Use

The following analysis addresses impacts on land use from building and operating the proposed facilities at the Perkins site in Davie County, North Carolina. In addition to land-use impacts from building and operations, the cumulative analysis for the Perkins site considers other past, present, and reasonably foreseeable future actions that could contribute to the cumulative land-use impacts, including other Federal and non-Federal projects and the projects listed in Table 9-6.

Site Description

The Perkins site is located in Davie County near the north-central border of North Carolina on the Yadkin River. The land was originally slated for the Perkins Nuclear Station in the 1970s but is now managed as game land by the North Carolina Wildlife Resources Commission under an agreement with Duke (NCWRC 2011a). The site grade elevation is between 720 and 730 ft with a maximum flood elevation of 650 to 660 ft; therefore there are no flood plains on the site (Duke 2009c). The site is not in the coastal zone. The area around the site is undergoing moderate residential development (Duke 2009c), especially near the proposed location of the three supplemental water reservoirs. Access to the site is off Route 801 to the north, which connects to US-601 and US-64 (Duke 2009c).

Building and Operation Impacts

As an undeveloped greenfield site, the Perkins site would require extensive grading and cut-fill activities to support a two-unit nuclear power facility. Development would require about 450 ac onsite (Duke 2009c) and approximately 1500 ac offsite for three supplemental water reservoirs (Duke 2010g). If the proposed project were to be built on the Perkins site, all or much of the site could no longer be managed by North Carolina Wildlife Resources Commission as game land. Table 9-7 summarizes expected land-use impact parameters for the Perkins site, supplemental water reservoirs, and ancillary facilities.

Table 9-7. Land-Use Impact Parameters for the Perkins Site

Parameter	Value	Source
Required project area	450 ac	Duke (2009c)
Number of supplemental water reservoirs	3	Duke (2009b)
Supplemental water reservoirs, area required	1500 ac	Duke (2010g)
Ancillary facilities	250 ac	Duke (2010g)
Number of new transmission-line routes	2	Duke (2010g)
Total transmission-line corridor distance (270-ft-wide corridor)	5.2 mi	Duke (2010g)
Railroad spur distance (100-ft-wide corridor)	6.3 mi	Duke (2010g)
Cooling-water pipeline (50-ft-wide corridor)	7.7 mi	Duke (2010g)

Duke estimates two transmission lines (2.4 mi and 2.8 mi) totaling 5.2 mi, each with a 270-ft corridor, would be needed to connect the site with the transmission system (Duke 2010g). Where possible, Duke would avoid populated areas and residences; however, land currently used for forests or timber production would be altered, replaced with grasses and other types of ground cover (Duke 2009c). A 6.3-mi railroad spur would have to be built to support construction deliveries, and a 7.7-mi pipeline would have to be built to convey cooling water (Duke 2010g). The review team concludes that the land-use impacts of building and operating two new nuclear power units at the Perkins site would be noticeable but not destabilizing.

Cumulative Impacts

For the analysis of cumulative land-use impacts, the geographic area of interest is considered to be the 50-mi region centered on the Perkins site, which includes all associated proposed transmission-line corridors (Figure 9-2). Land-use planning for transmission-line routing over wide areas must consider the land-use plans of adjoining counties and other land-managing agencies, rather than considering one county in isolation. Furthermore, in predominantly rural settings such as that surrounding the Perkins site, land-use changes occurring substantial distances away from a project site can substantially influence land-use planning decisions close to the site. Roads and other public facilities and services in rural areas tend to serve people who are spread thinly but broadly over large portions of the landscape. Therefore, land-use changes can affect roads and other facilities at greater distances than similar changes in more densely populated areas.

The proposed project would indirectly result in land conversions to residential areas, roads, and businesses to accommodate growth, new workers, and services related to the proposed nuclear facility. Other reasonably foreseeable projects in the area that could contribute to an increase in urbanization include potential development of new residences within easy commuting distance of the new plant and the development and upgrading of local roads and highways. Because the other projects described in Table 9-6 do not include reasonably foreseeable substantial changes in land-use types within 50 mi of the Perkins site, other than general growth and urbanization development discussed above, there would not be any significant additional cumulative impacts on land use from those activities.

As described above, building the proposed facilities, development of new transmission-line corridors, inundation of land for supplemental water reservoirs, and building the water intake and railroad spur to support the new units may affect more than 2200 ac of land. The overall land-use impacts of these activities would be regionally noticeable and permanent. If additional transmission lines were built for other energy projects developed within the geographic area of interest, there would be a cumulative land-use impact from the additional amount of land converted to utility corridor use for transmission lines. Because new transmission lines are often co-located with existing utility lines, the review team expects that the cumulative impact would be consistent with the land-use plans and zoning regulations of the affected counties.

Nonetheless, consistent with previous discussions, multiple new transmission-line corridors could noticeably alter land use within the geographic area of interest.

Due primarily to the extensive acreage required for development of the project, the review team concludes that the cumulative land-use impacts would be MODERATE. Considering the land needs noted above, building and operating two new nuclear units at the Perkins site would be a significant contributor to these impacts.

9.3.3.2 Water Use and Quality

This section describes the review team's assessment of impacts on water use and quality associated with building and operating two new nuclear units at the Perkins site. The assessment considers other past, present, and reasonably foreseeable future actions that affect water use and quality, including the other Federal and non-Federal projects listed in Table 9-6. The Perkins site hydrology, water use, and water quality are discussed in the ER (Duke 2009c) and in the response to an RAI (Duke 2010l).

The geographic area of interest for the Perkins site is considered to be the drainage basin of the Yadkin River upstream and downstream of the site because this is the resource that would be affected if the proposed project were located at the Perkins site. The Yadkin River drains part of north-central North Carolina before it becomes the Pee Dee River at the confluence with the Uwharrie River and crosses into South Carolina. The Pee Dee continues through eastern South Carolina before entering the Atlantic Ocean at Winyah Bay. For groundwater, the geographic area of interest is limited to the site because Duke has indicated no plans for use of groundwater to build and operate the plant (Duke 2009c).

The cooling- and service-water supply for a two-unit nuclear generating station located at the Perkins site would be the Yadkin River. Based on U.S. Geological Survey (USGS) streamflow (USGS 2011d) gage data the review team has independently estimated the average annual flow, the low monthly flow (30Q2 − the lowest average flow that occurs over 30 consecutive days and occurs once every 2 years on average), and the very low flow (7Q10 − the lowest average flow that occurs over 7 consecutive days that occurs once every 10 years, on average) conditions in the Yadkin River near the Perkins site to be 3000, 1153, and 630 cubic ft per second (cfs), respectively.

The Yadkin River has been identified by North Carolina as having an impaired use for fish consumption because of turbidity and mercury (NCDENR 2010c). The Pee Dee River has been identified by South Carolina as being impaired for fish consumption because of mercury, and impaired for aquatic life because of copper and lead (EPA 2010am).

Building Impacts

Because the building activities at the Perkins site would be similar to those at the Lee Nuclear Station site, the review team estimated the water needed for building activities at the Perkins site would be identical to the proposed water use for building at the Lee Nuclear Station site. Consistent with the Lee Nuclear Station, the review team assumed that groundwater would not be used. During building activities at the Lee Nuclear Station site, the average estimated water use is projected to be 250,000 gallons per day (gpd) or 0.39 cfs (see Table 3-5). This water-use rate is inconsequential when compared to the average annual flow in the Yadkin River (3000 cfs). The review team assumed that building activities could cease, if needed, during drought emergency without any significant overall impact on the schedule. Because the surface-water withdrawal would be minor compared to the average annual flow and because the withdrawal from the river would be temporary and limited to the building period, the review team concludes that the impact of surface-water use for building the potential units at the Perkins site would be minimal.

Duke stated that it would need to build three reservoirs at the Perkins site to support station operations. Duke's analysis of a worst-case drought based on the 2002 drought period indicates that a supplemental water supply would be required. During that drought period there were approximately 79 days when the Yadkin River flows dropped below 649 cfs, a river flow Duke estimated as the flow below which it would not be allowed to withdraw water from the river (Duke 2010l). The review team determined that the 2002 period of record represents the longest drought of record and that, of the 83 years in the historical record, only 15 years would require any withdrawal from the storage reservoir. Building the three reservoirs would alter the drainage of three tributary creeks to the Yadkin River to create the storage volume needed to supply supplemental condenser cooling water during future droughts of the magnitude experienced in 2002 (Duke 2010l). Based on the small number of creeks affected and their small drainage areas the changes to flow in the Yadkin as a result of building these reservoirs would not be detectable.

As stated above, the review team assumed that no groundwater would be used to build the units at the Perkins site. The review team also assumed that the impact of dewatering the excavations needed for building two units at the site would be temporary and minor at the Perkins site because technology (such as slurry walls, grouting) is readily available to control water inflow to the excavation if needed. Therefore, because there would be no groundwater use and the impact of dewatering would be temporary and minor, the review team determined that there would be minimal impact on groundwater resources.

Surface-water quality could be affected by stormwater runoff during site preparation and the building of the facilities. The North Carolina Division of Water Quality would require Duke to develop an SWPPP. The SWPPP would identify BMPs to control the impacts of stormwater runoff. The review team anticipates that Duke would construct new detention and infiltration ponds and drainage ditches to control delivery of sediment from the disturbed area to nearby waterbodies. Sediment carried with stormwater from the disturbed area would settle in the detention ponds and the stormwater would infiltrate into the shallow aquifer. As a result, stormwater runoff is not anticipated to affect water quality in the river. Therefore, during building activities, the surface-water-quality impacts near the Perkins site would be temporary and minimal.

While building new nuclear units at the Perkins site, impacts on groundwater quality may occur from leaching of spilled effluents into the subsurface. The review team assumes that the BMPs Duke has proposed for the Lee Nuclear Station site would also be in place during building activities at the Perkins site, and therefore the review team concludes that any spills would be quickly detected and remediated. As discussed in Section 4.2.3.1, the development of a SWPPP with its call for implementation of BMPs would minimize water-quality impacts. Because any spills related to building activities would be quickly remediated under BMPs, and the activities would be temporary, the review team concludes that the groundwater-quality impacts from building at the Perkins site would be minimal.

Operational Impacts

The review team assumed that the cooling-water system for the proposed plant, if built and operated at the Perkins site, would be similar to that proposed at the Lee Nuclear Station site; specifically, the cooling-water system would use cooling towers and blowdown would be discharged to the Yadkin River.

Duke proposes that three cooling-water reservoirs with a total capacity of 33,000 ac-ft would provide supplemental water during very low-flow conditions when adequate water from the river may not be available (Duke 2010l). Duke did not provide details of the cooling-water intake and effluent discharge locations. However, it is standard practice for power plants to design cooling-water intake and effluent discharge locations such that recirculation of discharged effluent to the intake does not occur.

Duke determined that the total amount of water withdrawn from the water source to operate two units would be approximately 35,000 gallons per minute (gpm) (78 cfs). About 2000 gpm (4.5 cfs) would be used for the screen wash system and thus return to the river at the intake location. As indicated for the Lee Nuclear Station site in Chapter 3, consumptive losses through evaporative losses and drift from cooling two units would be approximately 24,700 gpm (55 cfs) (Duke 2009c). The remaining 18 cfs would be returned via pipeline to the river at the discharge location. The water withdrawal and consumptive use represents 6.8 and 4.8 percent, respectively, of the Yadkin streamflow during low-flow conditions (30Q2) of 1153 cfs. Based on the small fraction of available water that would be used during low-flow conditions and the proposed use of a water-storage reservoir during very low-flow periods, the review team determined that the operational impact of the proposed plant at the Perkins alternative site on surface water would be minimal. Similar to the Lee Nuclear Station, the reservoir refill rate was assumed to be 200 cfs. This would be limited based on current in-stream flow conditions and would only be used after the reservoir had been drawn down to provide water for plant operation during drought periods.

As stated above, the review team assumed that no groundwater would be used to operate the units at the Perkins site. Therefore, because there would be no groundwater use, the review team determined that there would be no impact on groundwater resources.

During the operation of the proposed units at the Perkins site, impacts on surface-water quality could result from stormwater runoff, discharges of treated sanitary and other wastewater, and blowdown from cooling towers into the Yadkin River. The review team assumed that the blowdown rate would be the same as that at the Lee Nuclear Station site, 8216 gpm (18 cfs). Blowdown would be regulated by the North Carolina Department of Environment and Natural Resources (NCDENR) pursuant to 40 CFR Part 423 and all discharges would be required to comply with limits established by NCDENR in an NPDES permit.

The NCDENR would require Duke to develop an SWPPP. The plan would identify measures to be used to control stormwater runoff. Because stormwater controls would be in place and blowdown discharges would be regulated under an NPDES permit, the review team concludes that the impacts on surface-water quality from operation of two nuclear units at the Perkins site would be minimal.

During the operation of new nuclear units at the Perkins site, impacts on groundwater quality could result from potential spills. Spills that might affect the quality of groundwater would be prevented or remediated by using BMPs. Because BMPs would be used to quickly remediate spills and no intentional discharge to groundwater should occur, the review team concludes that the impacts on groundwater quality from operation of two nuclear units at the Perkins site would be minimal.

Cumulative Impacts

In addition to water-use and water-quality impacts from building and operations activities, cumulative impacts analysis considers other past, present, and reasonably foreseeable future actions that affect the same environmental resources.

For the cumulative analysis of impacts on surface water, the geographic area of interest for the Perkins site is the same as mentioned earlier in this section. Key actions that have past, present, and future potential impacts on surface-water supply and surface-water quality in this drainage basin include the operation of the W. Kerr Scott Reservoir upstream of the Perkins site and High Rock Lake, Tuckertown Reservoir, Badin Lake, and Falls Reservoir downstream of the site. These reservoirs and dams serve to increase the reliability of water supply to the region and to provide power. Lake Tillery and additional dams and reservoirs occur on the Pee Dee River downstream from the Perkins site.

The U.S Global Change Research Program (GCRP) has compiled the state of knowledge in climate change (GCRP 2009). This compilation has been considered in the preparation of this EIS. The projections for changes in temperature, precipitation, droughts, and increasing reliance on aquifers within the Yadkin River Basin are similar to those at other alternative sites in the region. These regional changes are discussed in Section 7.2 of this EIS.

Cumulative Water Use

Based on a review of the GCRP assessment of the Southeast United States region, the review team conservatively estimated a decrease in streamflow of 10 percent over the life of the station. By adjusting the historical flows for this climate change impact, the review team determined that the fraction of the withdrawal and consumptive water use for the revised low flow (30Q2) would increase from 6.8 to 7.5 percent and 4.8 to 5.3 percent, respectively. The review team also considered the increased water demands associated with an increased population in the region. The NCDENR indicates that water supplied for residential and non-residential use in the Yadkin-Pee Dee Basin will increase to 221 million gallons per day (Mgd) by 2020, an increase of 58 Mgd (90 cfs) over 1997 levels (NCDENR 2001).

By considering the impact of climate change on historical flows and allowing for continued increase in water demand due to population growth in the region, the review team determined that the reservoirs would be needed more frequently as time goes on and, in some instances, the plant would exhaust its water supply and the units might be required to derate or cease operation.

The impacts of the other projects listed in Table 9-6 are considered in the analysis above or would have little or no impact on surface-water use. The projects believed to have little impact are excluded from the analysis either because they are too distant from the Perkins site, use relatively little or no surface water, or have little or no discharge to surface water. Some projects (e.g., park and forest management) are ongoing, and changes in their operations that would have large impacts on surface-water use appear unlikely.

The review team determined that the cumulative impacts on water supply in the Yadkin River associated with operation of the proposed units, other water users, climate change, and population growth are MODERATE, but the incremental impact associated with water use for the Perkins site was determined not to be a significant contributor to the MODERATE impact.

As stated above, the review team assumed that no groundwater would be used to build or operate the units at the Perkins site and that groundwater impacts from dewatering would be temporary and minor. Therefore, the review team determined that the Perkins site by itself would have minimal impact on groundwater resources.

Other projects listed in Table 9-6 are, for the most part, 10 or more miles away from the Perkins site and thus will not contribute to a cumulative impact on groundwater supply within the ROI.

Because groundwater-use impacts are limited and temporary due to aquifer dewatering during the building phase, and other projects are not anticipated near the Perkins site, the review team concludes that cumulative impacts on groundwater use at the alternative site would be SMALL.

Cumulative Water Quality

Point and nonpoint sources have affected the water quality of the Yadkin River upstream and of the Yadkin and Pee Dee Rivers downstream of the site. Water-quality information presented above for the impacts of building and operating the proposed new units at the Perkins site would also apply to evaluation of cumulative impacts. The Yadkin River appears on North Carolina's list of impaired waters because of turbidity and the presence of mercury in fish tissue (NCDENR 2010c) and the Pee Dee River is listed on the South Carolina 303(d) list for mercury for fish consumption and copper and lead for aquatic life use (EPA 2010am). Therefore, the review team concludes that the cumulative impact on surface-water quality of the receiving waterbody would be MODERATE. As mentioned above, the State of North Carolina requires an applicant to develop a SWPPP. The plan would identify measures to be used to control stormwater runoff. The blowdown would be regulated by EPA pursuant to 40 CFR Part 423 and all discharges would be required to comply with limits established by NCDENR in a NPDES permit. Such permits are designed to protect water quality. Therefore, because industrial and wastewater discharges from the proposed units would comply with NPDES permit limitations and any stormwater runoff from the site during operations would comply with the SWPPP, the review team concludes that building and operating the proposed units at the Perkins site would not be a significant contributor to cumulative impacts on surface-water quality.

Other projects listed in Table 9-6 are, for the most part, 10 or more miles away from the Perkins site and thus will not contribute to a cumulative impact on groundwater quality in the ROI. The review team also concludes that with the implementation of BMPs, the impacts of groundwater quality from building and operating two new nuclear units at the Perkins site would likely be minimal. Therefore, the cumulative impact on groundwater quality would be SMALL.

9.3.3.3 Terrestrial and Wetland Resources

The following analysis includes impacts from building and operating the proposed new facilities on terrestrial ecology resources at the Perkins site. The analysis also considers past, present, and reasonably foreseeable future actions that affect the terrestrial ecological resources, including other Federal and non-Federal projects and the projects listed in Table 9-6. For the analysis of terrestrial ecological impacts at the Perkins site, the geographic area of interest includes the portions of Davie, Davidson, Forsyth, and Rowan Counties that are within a 15-mi radius of the Perkins site. This area encompasses the supplemental water reservoirs and all the ancillary facilities (two transmission lines, a cooling-water pipeline, and a railroad spur), and the important animal and plant species, communities, and wildlife aggregations that could be affected. The 15-mi distance was used by NCDENR for its species and habitat of concern occurrence analysis.

In developing this EIS, the review team relied upon reconnaissance-level information to perform the alternative site evaluation in accordance with ESRP 9.3 (NRC 2000a). Reconnaissance-level information is data that are readily available from agencies and other public sources such as scientific literature, books, and Internet websites. It also can include information obtained from site visits. To identify terrestrial resources at the Perkins site, the review team relied primarily on the following information:

- Perkins Nuclear Station ER (Duke Power Company 1974d) and Lee Nuclear Station COL ER and supplement (Duke 2009b, c)
- Lee Nuclear Station Joint Application for Activities Affecting Waters of the United States submitted by Duke (2011h) to the USACE
- a tour of the Perkins alternative site in April 2008 (NRC 2008d) and a tour of the Perkins site and reservoir sites in August 2010 (NRC 2010c)
- responses to RAIs provided by Duke (2010g)
- Endangered Species, Threatened Species, and Candidate Species in North Carolina (FWS 2010e) and North Carolina Natural Heritage Program (NCDENR 2012b) county record information
- correspondence regarding species and habitat occurrences from NCDENR (2012a).

Site Description

The Perkins site is situated within the Piedmont ecoregion in North Carolina (Griffith et al. 2002). As described in Section 7.3.1, the Piedmont ecoregion has been altered to a great extent since European settlement, primarily because of farming, agriculture, and silviculture. National Land Cover Data based on 2001 imagery (MRLC 2011) indicate that the Perkins site is a mixture of deciduous forest, evergreen forest, and pasture/herbaceous cover. Under an agreement with Duke, the Perkins site is managed as game land by the North Carolina Wildlife Resources Commission (NCWRC 2011a). As described in Section 9.3.3.1, operation of new facilities at the Perkins site would require three supplemental cooling-water reservoirs and ancillary facilities consisting of a railroad spur, two transmission lines, and a cooling-water pipeline.

The NRC staff visited the Perkins site in April 2008 and the Perkins site and the sites of the three associated cooling reservoirs in August 2010 (NRC 2008d, 2010c). The presumed power-block area consists mostly of open field vegetation, while the surrounding area consists mostly of approximately 30-year-old pine forest. The reservoir sites contain narrow riparian corridors consisting mostly of approximately 30-year-old bottomland hardwood forest with pastures and old-field areas located immediately upslope. In addition, pine plantations and a few single family residences may be affected by reservoir development. The reservoir sites are characteristic of small stream environments in the Piedmont ecoregion.

Federally Listed and State-Ranked Species, Communities, and Wildlife Aggregations

Duke provided no new field survey information for the Perkins site beyond its characterization in the early 1970s for the Perkins Nuclear Station (Duke Power Company 1974d). The review team is unaware of any field surveys at the locations of the three cooling-water reservoirs or the ancillary facilities. The presence/absence of Federally listed and State-ranked species, communities, and wildlife aggregations in the project footprint cannot be ascertained without field surveys.

A query of the North Carolina Natural Heritage Program database (NCDENR 2012a) indicates the presence of 35 species, communities, and wildlife assemblages within 15 mi of the Perkins site in Davie, Davidson, Forsyth, and Rowan Counties that are either Federally listed as threatened, endangered, or candidates for listing, and/or are ranked by the State of North Carolina as critically imperiled, imperiled, or vulnerable (Table 9-8). Table 9-8 lists species habitat affinities. The State ranking (in addition to the Federal listing) provides the only common basis for comparison of numbers of important animal and plant species, communities, and wildlife aggregations among the proposed and alternative sites located in North Carolina and South Carolina. Some of the State-ranked animal and plant species have also been assigned a State protection status as threatened, endangered, of concern, or significantly rare (Table 9-8).

Of the 35 species, communities, and wildlife aggregations documented in Table 9-8, 2 are listed as Federally endangered and one is a candidate for listing. Michaux's sumac (*Rhus michauxii*) is considered endangered and is currently known from Davie County. Schweinitz's sunflower (*Helianthus schweinitzii*) is considered endangered and is currently known from Davidson and Rowan counties. Georgia aster (*Symphyotrichum georgianum*) is a candidate species and is currently known in Davidson and Rowan counties (FWS 2010e). These three species occur in open areas such as utility corridors (FNA 1993+; Gleason and Cronquist 1991). Bald eagles (*Haliaeetus leucocephalus*) are currently protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d) and are known to occur in Davidson and Rowan counties.

Two North Carolina State rare plant species—spring coral-root (*Corallorhiza wisteriana*) and ringed witch grass (*Dichanthelium annulum*)—have been documented within or adjacent to the project footprint. Spring coral-root has been documented within the Perkins site and in the vicinity of the cooling-water pipeline (Duke 2010g). The species has a sporadic distribution, and either has not been found in recent surveys within Davie County; or has not been surveyed recently enough to be confident that it is still present; or the occurrence is thought to be destroyed (NCDENR 2012b). Ringed witch grass has been documented within the vicinity of the Perkins site and supplemental water reservoirs (Duke 2010g). The species is on the periphery of its range in North Carolina, and either has not been found in recent surveys within Davie or Rowan Counties; or has not been surveyed recently enough to be confident that it is still present; or the occurrence is thought to be destroyed (NCDENR 2012b).

Table 9-8. Terrestrial Federally Listed Species and Candidate Species, and State-Ranked Species, Communities, and Wildlife Aggregations within 15 mi of the Perkins Site in Davie, Davidson, Forsyth, and Rowan Counties, North Carolina

Scientific Name	Common Name	Federal Status[a]	NC State Rank/ Protection Status[b]	Counties of Occurrence[c]	Habitat[d]
Mammals					
Myotisleibii	eastern small-footed bat	-	S3/SC	Davidson (current)	hilly or mountainous areas, in or near deciduous or evergreen forest
Birds					
Haliaeetus leucocephalus	bald eagle	BGEPA	S3B-S3N/T	Davidson (current), Rowan (current)	major rivers, large lakes, reservoirs[e]
Lanius ludovicianus	loggerhead shrike	-	S3B-S3N/SC	Davie (current), Davidson (current), Forsyth (current)	open country with scattered trees and shrubs
Amphibians					
Ambystoma talpoideum	mole salamander	-	S2/SC	Davidson (current), Rowan (current)	near breeding ponds in pine flatwoods, floodplains, and bottomland hardwood forests
Plants					
Amorpha schwerinii	Piedmont indigo-bush	-	S3/SR-T	Davidson (current), Rowan (current)	xeric and rocky forests and woodlands
Brachythecium rotaeanum	Rota's feather moss	-	S1/SR-D	Rowan (historical)	rotted logs, tree bases, wet forests[f]
Corallorhiza wisteriana	spring coral-root	-	S1S2/SR-O	Davie (historical)	moist forests

Table 9-8. (contd)

Scientific Name	Common Name	Federal Status[(a)]	NC State Rank/ Protection Status[(b)]	Counties of Occurrence[(c)]	Habitat[(d)]
Cirsium carolinianum	Carolina thistle	-	S2/E	Rowan (current)	prairies, open woodlands
Dichanthelium annulum	ringed witch grass	-	S1/SR-P	Davie (historical), Rowan (historical)	dry sandy or rocky soil of open woods, dry grasslands, barrens, and glades
Helianthus schweinitzii	Schweinitz's sunflower	E	S3/E	Davidson (current), Rowan (current)	woodlands and roadsides, xeric oak-pine woodlands, mowed road or powerline corridors
Hexalectris spicata	crested coralroot	-	S2/SR-P	Davidson (historical), Davie (historical)	dry forests and woodlands
Isoetes piedmontana	Piedmont quillwort	-	S2/E	Rowan (historical)	seepage on granitic flatrocks
Isoetes virginica	Virginia quillwort	-	S1/SR-L	Rowan (historical)	in woodland streams
Lotus helleri (=*Acmispon helleri*)	Carolina birdfoot-trefoil	-	S3/SC-V	Davidson (current), Rowan (current), Davie (historical)	dry woodlands and openings, originally probably prairie-like sites, now along roadbanks, railroads, powerline corridors
Matelea decipiens	glade milkvine	-	S3/SR-P	Davidson (historical)	woodlands and thickets
Minuartia uniflora	single-flowered sandwort	-	S1/E	Rowan (historical)	granitic flatrocks

Table 9-8. (contd)

Scientific Name	Common Name	Federal Status[a]	NC State Rank/ Protection Status[b]	Counties of Occurrence[c]	Habitat[d]
Portulaca smallii	Small's portulaca	-	S2/T	Forsyth (current), Rowan (current)	granitic and diabase flatrocks, sometimes spreading to adjacent fields, mowed areas, or other disturbed areas
Rhus michauxii	Michaux's sumac	E	S2/E	Davie (current)	sandy or rocky open woods, usually on ridges with a disturbance history (periodic fire, prior agricultural use, maintained right-of-ways)[g]
Ruellia purshiana	Pursh's wild-petunia	-	S2/SC-V	Davidson (current), Forsyth (historical)	dry woodlands and forests
Silphium terebinthinaceum	prairie dock	-	S2/SR-P	Davie (current)	glades, barrens, woodlands, and roadsides
Symphyotrichum georgianum	Georgia aster	C	S3/T	Davidson (current), Rowan (current)	dry, rocky woodlands; woodland borders; roadbanks; and powerline corridors
Tortula papillosa	papillose tortula	-	S1/SR-P	Davie (historical)	grows on mature trees[h]
Communities					
basic mesic forest (Piedmont subtype)	-	-	S3S4	Davidson (current), Davie (current), Forsyth (current), Rowan (current)	-

Table 9-8. (contd)

Scientific Name	Common Name	Federal Status[(a)]	NC State Rank/ Protection Status[(b)]	Counties of Occurrence[(c)]	Habitat[(d)]
dry basic oak-hickory forest	-	-	S2S3	Davidson (current), Rowan (current)	-
dry-mesic basic oak-hickory forest (Piedmont subtype)			S3	Davie (current), Davidson (current), Rowan (current)	
floodplain pool	-	-	S2	Davie (current), Rowan (current)	-
low-elevation seep (floodplain subtype)	-	-	S2	Davidson (current), Forsyth (current)	-
mesic mixed hardwood forest (Piedmont subtype)			S3S4	Davidson (current), Davie (current), Forsyth (current), Rowan (current)	
mixed moisture hardpan forest			S2	Davie (current)	
Piedmont bottomland forest (high subtype)	-	-	S2	Davie (current),	-
Piedmont bottomland forest (typic low subtype)			S2	Davidson (current), Davie (current)	
Piedmont levee forest (typic subtype)	-	-	S3S4	Davidson (current), Forsyth (current), Rowan (current)	-
Piedmont swamp forest	-	-	S2	Rowan (current)	-

Table 9-8. (contd)

Scientific Name	Common Name	Federal Status[(a)]	NC State Rank/ Protection Status[(b)]	Counties of Occurrence[(c)]	Habitat[(d)]
upland depression swamp forest	-	-	S2S3	Davidson (current), Rowan (current)	-
Wildlife Aggregations					
colonial wading bird colony	-	-	S3	Davidson (current), Forsyth (current), Rowan (current)	-

Source: Federal Status, NC State Rank/Protection Status (NCDENR 2012a)
Source: Counties of Occurrence (NCDENR 2012b)
Source: Habitat (as noted)
(a) Federal status: E = endangered, C = candidate, BGEPA = species not protected under the Endangered Species Act of 1973, as amended, but protected under Bald and Golden Eagle Protection Act (FWS 2010e).
(b) State rank: S1 = critically imperiled, S2 = imperiled, S3 = vulnerable, S4 = apparently secure, S#S# = a numeric range rank used to indicate uncertainty about the exact status of the element, B = breeding, N = non-breeding. State status: E = endangered, T = threatened, SC = special concern, SC-V = special concern/vulnerable, SR-D = significantly rare/disjunct (disjunct to North Carolina from its main range), SR-L = significantly rare/limited (only found in North Carolina and adjacent states, with a majority of populations in North Carolina), SR-O = significantly rare/range is sporadic (other), SR-P = significantly rare/species at the periphery of its range, SR-T = significantly rare/throughout its range (fewer than 100 populations total) (NCDENR 2012b).
(c) current = There is at least one record for the element in the region that has been seen recently. historical = either the element has not been found in recent surveys in the region; or it has not been surveyed recently enough to be confident they are still present; or the occurrence is thought to be destroyed (NCDENR 2012b).
(d) NatureServe Explorer (2010) for animals and Weakley (2010) for plants, unless otherwise indicated.
(e) 64 FR 36454.
(f) NatureServe Explorer (2010).
(g) FWS (2012c).
(h) British Bryological Society (2010).

Building Impacts

Building activities for two nuclear units would remove about 288 ac of high-quality wooded habitat (Duke 2010g) and disturb about 0.5 ac of wetlands (Duke 2010g, 2011h). Site preparation for the railroad spur, two transmission lines, and cooling-water pipeline would remove approximately 140 ac of high-quality wooded habitat (Duke 2010g) and disturb about 24 ac of wetlands (Duke 2010g, 2011h). Site preparation and inundation of the three supplemental cooling reservoirs would impact about 1000 ac of high-quality wooded habitat (Duke 2010g)and about 92 ac of wetlands (Duke 2010g, 2011h). Site preparation at the Perkins site and the ancillary facilities, and site preparation and inundation of the three cooling reservoirs, would affect 222,000 linear ft (approximately 42 mi) of streams (Duke 2010g, 2011h). The riparian corridors of about 187,000 linear ft (approximately 35 mi) of these streams would be permanently inundated by creation of the three reservoirs. It is uncertain to what extent riparian corridors would be affected along the other 35,000 linear ft (approximately 7 mi) of streams associated with the Perkins site and ancillary facilities, because it would depend on the need to clear riparian vegetation (e.g., for transmission-line clearance), and the length of stream that would be so affected has not been determined (Duke 2011h). The overall impact of reservoir development on terrestrial resources at the three supplemental cooling-reservoir sites would be noticeable and permanent.

Two State-ranked rare plant species could be affected by development of the Perkins site and associated facilities (Duke 2010g). Other important species that may be present in the project footprint (Table 9-8) could also be affected. Impacts on wildlife at the Perkins site would be noticeable, similar to those described for the proposed Lee Nuclear Station site in Section 4.3.1.

Operational Impacts

Impacts on terrestrial ecological resources from operation of two new nuclear units at the Perkins site would be minor and similar to those for the proposed Lee Nuclear Station site as described in Section 5.3.1. There may be minor differences in operational impacts because of factors such as climate, topography, and elevation.

Cumulative Impacts

Overlaying the historic impacts in the Piedmont ecoregion discussed in the Site Description above are the current projects listed in Table 9-6. Projects located within the geographic area of interest include Boone's Cave State Park, Tanglewood Park, the Winston-Salem Northern Beltway, Buck Combined Cycle Station, Plant Rowan, and two manufacturing facilities (one glass and the other plastic). The development of most of these projects has further reduced, fragmented, and degraded natural forests and wetland habitat and decreased habitat connectivity. In contrast, the parks protect local terrestrial resources in perpetuity. Reasonably foreseeable projects and land uses within the geographic area of interest that would affect terrestrial resources include ongoing silviculture, farming, and agricultural development, and residential and possibly some limited commercial development.

Summary

Impacts on terrestrial ecology resources are estimated based on the information provided by Duke and the review team's independent review. Site preparation and inundation of the three cooling-water reservoirs, and site preparation and development of the Perkins site, two new transmission-line corridors, a water-pipeline corridor, and a railroad spur would affect a total of about 1428 ac of high-quality forest habitat, about 117 ac of wetlands, and about 42 mi of riparian corridor. The overall impact of these activities on habitat and wildlife would be noticeable and permanent, particularly in the watersheds containing the three reservoirs. There are 22 Federally listed or State-ranked terrestrial species, 12 communities, and 1 wildlife aggregation that potentially occur at the Perkins site and associated facilities that may be affected. There are past, present, and future activities in the geographic area of interest that have affected and would continue to significantly affect habitat and wildlife in ways similar to site preparation and development for the above facilities (i.e., silviculture, farming, and agricultural development, and residential and possibly some limited commercial development).

The review team concludes that the cumulative impacts from past, present, and reasonably foreseeable future actions, including two new nuclear units at the Perkins site and associated facilities, on baseline conditions for terrestrial ecological resources in the geographic area of interest would be MODERATE. The incremental contribution to these impacts from building and operating two new nuclear units at the Perkins site would be significant. The impact could be greater if Federally listed species are present.

9.3.3.4 Aquatic Resources

The following analysis includes impacts from building and operating the proposed new facilities on aquatic ecology resources at the Perkins site. The analysis also considers past, present, and reasonably foreseeable future actions that affect the aquatic ecological resources, including other Federal and non-Federal projects and the projects listed in Table 9-6. For the analysis of aquatic ecological impacts at the Perkins site, the geographic area of interest includes the Yadkin River Headwaters Watershed to the upper end of High Rock Lake at the confluence of the Yadkin River and the South Yadkin River, including the tributaries that would be impounded to create three supplemental water reservoirs, and waterbodies crossed by the ancillary facilities (two transmission-line corridors, a cooling-water pipeline, and a railroad-spur corridor). This geographic region is considered the most likely to show impacts on water quality relative to the water-quality criteria for aquatic biota.

In developing this EIS, the review team relied upon reconnaissance-level information to perform the alternative site evaluation in accordance with ESRP 9.3 (NRC 2000a). Reconnaissance-level information is data that are readily available from agencies and other public sources such as scientific literature, books, and Internet websites. It also can include information obtained through site visits. To identify aquatic resources at the Perkins site, the review team relied primarily on the following information:

- Perkins Nuclear Station ER (Duke Power Company 1974d) and Lee Nuclear Station COL ER and supplement (Duke 2009b, c)
- Lee Nuclear Station Joint Application for Activities Affecting Waters of the United States submitted by Duke (2011h) to the USACE
- a tour of the Perkins alternative site in April 2008 (NRC 2008d) and a tour of the Perkins alternative site and supplemental cooling-water reservoir sites in August 2010 (NRC 2010c)
- responses to RAIs provided by Duke (2010g, 2010l)
- Endangered Species, Threatened Species, and Candidate Species in North Carolina (FWS 2010e) and North Carolina Natural Heritage Program county record searches (NCDENR 2012b)
- correspondence regarding species occurrence from the NCDENR (NCDENR 2012a).

Site Description

The Perkins site is a greenfield site located on the Yadkin River in Davie County, North Carolina. The site is owned by Duke and managed by the NCWRC. The Yadkin River, which borders the south side of the alternative reactor site, is the largest and most important aquatic resource near the Perkins site.

The staff visited the Perkins site in April 2008 and August 2010 (NRC 2008d, 2010c). The Yadkin River near the proposed cooling-water intake site had steep vegetated banks covered with riparian vegetation. The streams that would be converted to cooling-water reservoirs contain narrow riparian corridors. The cooling-water reservoir sites are characteristic of small stream environments in the Piedmont ecoregion.

Recreationally Important Species

Some fish commonly caught in the Yadkin River near the Perkins site include Largemouth Bass (*Micropterus salmoides*), Smallmouth Bass (*M. dolomieu*), Spotted Bass (*M. punctatus*), sunfish (*Lepomis* spp.), catfish (*Ameiurus, Ictalurus,* and *Pylodictis* spp.), Striped Bass (*Morone saxatilis*), and White Bass (*M. chrysops*). These fish are common to this region of the state.

Non-Native and Nuisance Species

Spotted Bass are not native to North Carolina but have been illegally introduced by anglers because they are a popular sport fish. They may competitively displace Smallmouth and Largemouth Bass (NCWRC 2010). Spotted Bass also are correlated with declines in crappie fisheries (*Pomoxis* spp.) in some areas.

Federally Listed and State-Ranked Species

Duke provided no new field survey information for the Perkins site beyond its characterization in the early 1970s for the Perkins Nuclear Station (Duke Power Company 1974d). The review team is unaware of any field surveys performed at the sites of the proposed three cooling-water reservoirs, the two transmission-line corridors, water-pipeline corridor, or railroad-spur corridor. The presence/absence of Federally listed and State-ranked species in the project footprint cannot be ascertained without field surveys.

A recent review of the Federally listed and State-ranked aquatic species that may occur in Davie, Davidson, Forsyth, and Rowan Counties in North Carolina near the Perkins site was performed by the review team. No Federally listed aquatic species were identified. State-ranked species included five fish, one crayfish, seven mussels, and five insects, as shown in Table 9-9. The State ranking (in addition to the Federal listing) provides the only common basis for comparison of numbers of important aquatic species among the proposed and alternative sites located in North Carolina and South Carolina. The 18 State-ranked species include the Quillback (*Carpoides cyprinus*), Carolina Darter (*Etheostoma collis*), Roanoke Hog Sucker (*Hypentelium roanokense*), Bigeye Jumprock (*Moxostoma ariommum*) and Robust Redhorse (*M. robustum*); the Greensboro burrowing crayfish (*Cambarus catagius*); the brook floater *(Alasmidonta varicosa),* yellow lampmussel (*Lampsilis cariosa*), eastern lampmussel (*L. radiata*), creeper (*Strophitus undulatus*), notched rainbow (*Villosa constricta*), eastern creekshell (*V. delumbis*), and Carolina creekshell (*V. vaughaniana*); the Cherokee clubtail dragonfly (*Gomphus consanguis*), Cahaba sand-filtering mayfly (*Homoeoneuria cahabensis*) and three other insects with aquatic life stages (a caddisfly [*Dibusa angata*], a mayfly [*Macdunnoa brunnea*], and the mountain river cruiser mayfly [*Macromia margarita*]). In addition, the Robust Redhorse, brook floater, yellow lampmussel, and Carolina creekshell are assigned a State protection status of endangered and the Bigeye Jumprock, eastern lampmussel, and creeper are assigned a State protection status of threatened. Of the species listed in Table 9-9, the Quillback, yellow lampmussel, eastern lampmussel, Cahaba sand-filtering mayfly, and the *Dibusa* caddisfly have been positively identified by the State as occurring within 15 mi of the Perkins site (NCDENR 2012a). The State-ranked species are listed in Table 9-9 along with their counties of occurrence, but only the State-listed (i.e., protected) species are discussed in further detail.

Table 9-9. Aquatic Federally Listed Species and State-Ranked Species in Davie, Davidson, Forsyth, and Rowan Counties, North Carolina

Scientific Name	Common Name	Federal Status[a]	NC State Rank/ Protection Status[b]	Counties of Occurrence[c]
Fish				
Carpoides cyprinus	Quillback	-	S2?/SR	Davidson (current) Davie (current) Forsyth (current)
Etheostoma collis	Carolina Darter	-	S3/SC	Davidson (current))
Hypentelium roanokense	Roanoke Hog Sucker		S3/SR	Forsyth (current)
Moxostoma ariommum	Bigeye Jumprock	-	S1/T	Forsyth (current)
Moxostoma robustum	Robust Redhorse	-	S1/E	Davidson (historical) Davie (historical)
Crayfish				
Cambarus catagius	Greensboro burrowing crayfish	-	S2/SC	Davidson (current)
Mussels				
Alasmidonta varicosa	Brook floater	-	S1/E	Forsyth (current)
Lampsilis cariosa	Yellow lampmussel	-	S1/E	Davie (current) Rowan (current)
Lampsilis radiata	Eastern lampmussel	-	S1S2/T	Davidson (current) Rowan (current)
Strophitus undulatus	Creeper	-	S2/T	Davidson (obscure) Forsyth (current)
Villosa constricta	Notched rainbow	-	S3/SC	Davidson (current) Rowan (current)
Villosa delumbis	Eastern creekshell	-	S3/SR	Davidson (current)
Villosa vaughaniana	Carolina creekshell	-	S2/E	Rowan (current)
Insects (with aquatic lifestage)				
Dibusa angata	A caddisfly	-	S2/SR	Davie (current) Rowan (current)
Gomphus consanguis	Cherokee clubtail dragonfly	-	S1?/SR	Davie (obscure)
Homoeoneuria cahabensis	Cahaba sand-filtering mayfly	-	S2/SR	Rowan (current)
Macdunnoa brunnea	A mayfly	-	S2/SR	Davie (current)
Macromia margarita	Mountain river cruiser mayfly		S1S2/SR	Davie (current)

(a) Federal status: (FWS 2010e).
(b) State rank: S1 = critically imperiled, S2 = imperiled, S3 = vulnerable, ? = uncertain (inexact or uncertain numeric rank used as a qualifier), S#S# = a numeric range rank used to indicate uncertainty about the exact status of the element; State protection status: E = endangered, T = threatened, SC = special concern, SR = significantly rare (NCDENR 2012b).
(c) current = There is at least one record for the element in the region that has been seen recently. historical = Either the element has not been found in recent surveys in the region, or it has not been surveyed recently enough to be confident they are still present; or the occurrence is thought to be destroyed. obscure = The date the element was last observed in the region is uncertain (NCDENR 2012b).

Bigeye Jumprock

The Bigeye Jumprock is a sucker species that inhabits the Upper and Middle Roanoke River drainage in North Carolina. This basin touches the northeast corner of Forsyth County, but the fish has not been recorded from the Pee Dee River Basin. It is unlikely that the Bigeye Jumprock is present in the Yadkin River near the proposed Perkins site. Therefore, it is not likely to be directly affected by the building or operation of two new nuclear units at the Perkins site.

Robust Redhorse

In North Carolina, Robust Redhorse are found in the Pee Dee River downstream of Blewett Falls Dam (NCWRC 2007). Habitat loss resulting from the impoundment of North Carolina rivers and streams has precipitated a decline in the species' numbers and range. In the Pee Dee River, spawning takes place in large, rocky shoals (NCWRC 2007). Other factors in the Robust Redhorse's decline is the deterioration of water quality because of sedimentation and pollution, as well as predation and competition for resources by non-native species such as the Flathead Catfish (*Pylodictis olivaris*), Blue Catfish (*Ictalurus furcatus*), and Smallmouth Buffalo (*Ictiobus bubalis*) (NCWRC 2007). Because Robust Redhorse are blocked from further upstream migration by Blewett Falls Dam, this species is not likely to be directly affected by the building or operation of a nuclear facility at the Perkins site.

Brook Floater

In North Carolina, the brook floater is found in the Pee Dee River Basin. It has been seen recently in Forsyth County, upstream from the proposed Perkins site (NCWRC 2008b). It prefers clean, swift waters with stable gravel or sand and gravel substrates, although it has infrequently been found in sandy/silty substrate in shallow water with little current. The Yadkin River near the Perkins site may be too turbid to support a brook floater population; however, because recent surveys have not been conducted specifically looking for the species in the vicinity of the Perkins site, it is possible that one or more could be present and could potentially be affected by station construction and/or operation.

Yellow Lampmussel

In North Carolina, the yellow lampmussel has been found in the Pee Dee, Waccamaw, Cape Fear, Neuse, and Tar River Basins. Within the Pee Dee River Basin it has been reported in Montgomery County (Little River Basin) (NCWRC 2008b). The yellow lampmussel can be found in many different habitats; however, it appears to slightly prefer the shifting sands downstream from large boulders in relatively fast flowing, medium-sized rivers and medium-to-large-sized creeks (NCWRC 2008b). It is unlikely that the yellow lampmussel is present in the

Yadkin River near the proposed Perkins site. Therefore, it is not likely to be directly affected by the building or operation of two new nuclear units at the Perkins site.

Eastern Lampmussel

The range of the eastern lampmussel includes the PeeDee, Waccamaw, Cape Fear, Neuse, and Pamlico Basins, and in particular the Lower Yadkin River (NatureServe Explorer 2010). The eastern lampmussel is considered to be doing well throughout its range with a stable or increasing population. It is highly tolerant of environmental conditions and uses common fish species as hosts. It finds a wide variety of habitats suitable, including small streams, large rivers, ponds and lakes, although it prefers a sand or gravel bottom. It has been observed within 15 mi of the proposed site, though downstream of the proposed site in a tributary to the Yadkin River. Therefore, it is not likely to be directly affected by the building or operation of two new nuclear units at the Perkins site.

Creeper

The creeper is found in the Atlantic slope and Interior Basin drainages of North Carolina, including the Broad, Pee Dee, Cape Fear, Neuse, Pamlico, and Roanoke River Basins (Bogan 2002). The species is found in a variety of aquatic habitats, but nearly always in shallow water of depths no more than 3 or 4 ft. It is sometimes found in lakes, but appears unable to reproduce in lake habitat (SCDNR 2005). It is generally restricted to streams with very good water quality so it may be more sensitive to sedimentation and pollution than many other mussel species. The species is listed as threatened in North Carolina because it appears to be declining throughout its range. A 2007 mussel survey of the Upper Yadkin River (above the proposed Perkins site) discovered seven individuals (Jones et al. 2007).

Carolina Creekshell

The range of the Carolina creekshell includes the Yadkin-Pee Dee River Basin, but downstream from the Perkins site and outside the geographic area of interest (NCWRC 2011b). While typically found in silty sand or clay along the banks of small streams, the Carolina creekshell also may inhabit substrates of mixed sand and gravel. Because it is unlikely to be located near the proposed Perkins site, it is not likely to be directly affected by building or operating two new nuclear units at the Perkins site.

Critical Habitats

No critical habitat has been designated by the U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS) in the vicinity of the Perkins site.

Building Impacts

Building impacts would likely include impacts on water quality from direct (e.g., dredging, shoreline excavation, clearing, impoundment) and indirect (e.g., stormwater runoff, sedimentation) sources. Two new reactor units at the site would require cooling-water intake and effluent discharge systems. Water would be withdrawn from the Yadkin River (Duke 2009c). Blowdown would also be discharged to the Yadkin River downstream from the intake. Operation of new facilities at the Perkins site would require three new supplemental cooling-water reservoirs (totaling 1500 ac [Duke 2010g] with approximately 33,000 ac-ft of storage [Duke 2010l]), and ancillary facilities consisting of a railroad spur, two transmission lines, and a cooling-water pipeline (Duke 2010g). Two new transmission lines would be required to connect the site to the existing transmission-line corridors, as discussed in Section 9.3.3.1. Site preparation and development impacts on aquatic resources from the transmission lines would be similar to those described for the proposed Lee Nuclear Station site in Section 4.3.2. The new reactor site, reservoirs, and ancillary facilities would impact an estimated 222,000 linear ft (approximately 42 mi) of creek systems, which includes the conversion of 187,000 linear ft of stream from lotic to lentic ecosystems for the supplemental cooling-water reservoirs (Duke 2010g). Building activities would also affect a total of 2.6 ac of open water (2.4 ac associated with reservoirs and 0.2 ac associated with ancillary features) (Duke 2011h). The impacts of building two new nuclear units and three new reservoirs on the aquatic ecology of the Yadkin River and its tributaries would be clearly noticeable and permanent.

Operational Impacts

Because a closed-cycle cooling system and supplemental cooling-water reservoirs are proposed for the Perkins site, operational impacts would be expected to be similar to those for the proposed Lee Nuclear Station site as described in Section 5.3.2.

Cumulative Impacts

Current actions in the vicinity that have present and future potential impacts on aquatic ecological resources include discharge of water by domestic and industrial NPDES permit holders, withdrawal of water for domestic and industrial purposes, the existence of nature preserves, and future urbanization of the area (Table 9-6).

Within the Yadkin River Headwaters Watershed, there are currently at least one major and two minor NPDES discharge permit holders, including wastewater-treatment plants (NCDENR 2008a). Just downstream from the Headwaters Watershed and just upstream of High Rock Lake, Duke operates the Buck Combined Cycle Station. The station's cooling towers use ambient air for steam condenser cooling, which minimizes intake and discharge impacts on the Yadkin River. No heated water is discharged to the Yadkin River (Duke Energy 2013c). Tanglewood Park and Boone's Cave Park preserve some of the Yadkin River shoreline upstream and downstream from the Perkins site, respectively, thereby limiting the potential for future urbanization in those areas. Reasonably foreseeable projects and water uses within the geographic area of interest that would affect aquatic resources include farming, and agricultural development, and residential and possibly some limited commercial development.

Summary

Impacts on aquatic ecology resources are estimated based on the information provided by Duke and the review team's independent review. The most noticeable building activities would affect about 222,000 linear ft (approximately 42 mi) of stream habitat and the associated aquatic species (Duke 2010g). The impacts of building two new nuclear units and three new reservoirs on the aquatic ecology of the Yadkin River and tributaries would be clearly noticeable.

There are 18 State-ranked aquatic species that potentially occur near the Perkins site and associated facilities that may be affected. Five of these species have been positively identified as occurring within 15 mi of the Perkins site (NCDENR 2012a). Surveys to determine the presence or absence of other Federally listed and State-ranked species have not been performed in the recent past.

The review team concludes that the cumulative impacts from past, present, and reasonably foreseeable future actions, including two new nuclear units at the Perkins site and associated facilities, on baseline conditions for aquatic ecological resources in the geographic area of interest would be MODERATE. The incremental contribution to these impacts from building and operating two new nuclear units at the Perkins site would be significant. The impact would be greater if surveys reveal that Federally listed species are present.

9.3.3.5 Socioeconomics

For the analysis of socioeconomic impacts at the Perkins site, the geographic area of interest is considered to be the 50-mi region centered on the Perkins site with special consideration of the two-county area of Davie and Forsyth Counties, where the review team expects socioeconomic impacts to be the greatest. In evaluating the socioeconomic impacts of building and operations at the Perkins site, the review team undertook a reconnaissance survey of the region using readily obtainable data from the ER; the alternative site audit; and Federal, State, and local government agencies. The cumulative impacts analysis also considers other past, present, and reasonably foreseeable future actions that affect the same environmental resources, including other Federal and non-Federal projects and the projects listed in Table 9-6.

Socioeconomic impacts span the issues of physical impacts, demography, economic conditions and taxes, and infrastructure and community services. The impacts of building and operating the new units are discussed below.

Physical Impacts

Many physical impacts of building and operation would be similar regardless of the site. Building activities can cause temporary and localized physical impacts such as noise, odor, vehicle exhaust, vibration, shock from blasting, and dust emissions. The use of public roadways, railways, and waterways would be necessary to transport materials and equipment. Offsite areas that would support building activities (e.g., borrow pits, quarries, and disposal sites) would be expected to be already permitted and operational. Offsite activities would include the development of three supplemental reservoirs, a railroad spur, new transmission-line corridors, and a cooling-water pipeline (Duke 2010g). Part of the area proposed for the supplemental reservoirs has been moderately developed with housing, which would have to be removed.

Potential impacts from station operation include noise, odors, exhausts, thermal emissions, and aesthetics. New units would produce noise from the operation of pumps, cooling towers, transformers, turbines, generators, and switchyard equipment. In addition, traffic at the site would be a source of noise. The review team assumed that same standard noise protection and abatement procedures used for the Lee Nuclear Station site would be used to control noise at the Perkins site. Commuter traffic would be controlled by speed limits. Good road conditions and appropriate speed limits would minimize the noise level generated by the workforce commuting to the Perkins site.

The new units at the Perkins site would likely have standby diesel generators and auxiliary power systems. Permits obtained for these generators would ensure that resultant air emissions comply with applicable regulations. In addition, the generators would be operated on a limited, short-term basis. During normal plant operation, new units would not use a significant quantity of chemicals that could generate odors that exceed odor detection threshold values. Good access roads and appropriate speed limits would minimize the dust generated by the commuting workforce.

Areas used for forests and timber production would be altered by development of the two new transmission-line corridors (Duke 2009c). The Perkins site is a greenfield site, but the surrounding area is undergoing a moderate amount of residential development, particularly where the supplemental reservoirs would be constructed (Duke 2009b, c). The review team concludes that the impacts of building two units, three supplemental water reservoirs, and ancillary facilities at the Perkins site on aesthetics would be noticeable, but that the impacts for operations would be minimal.

Based on the information provided by Duke and the review team's independent evaluation, the review team concludes that the physical impacts of building and operating two new nuclear units at the Perkins site would be minimal except for a noticeable physical impact on aesthetics during the building phase.

Demography

The Perkins site is located in Davie County, North Carolina, with a population of 40,581 near the towns of Mocksville (population 4952) and Bermuda Run (population 1667), which are located to the west and north of the site, respectively (USCB 2010e). Also within the 50-mi region are the Cities of Lexington (population 19,155), which is in Davidson County (population 160,638); Winston-Salem (population 224,769), which is located in Forsyth County (population 342,989); and Greensboro (population 263,358) which is located in Guilford County (USCB 2010e).

Based on the proposed site location, the regional population distribution, and U.S. Census Bureau Journey to Work Data (USCB 2000h), the review team expects the in-migrating population would reside in the two-county area of Davie and Forsyth Counties. The review team realizes that workers may choose to live in other counties within the 50-mi region, but given the small number of workers and the large population base the review team expects impacts on other counties to be *de minimis.* Therefore, these two counties compose the economic impact area and are the focus of the following analysis.

At the peak of the nuclear power station development, Duke expects the workforce onsite to be approximately 4613 workers. Because the Perkins site is similar to the proposed Lee Nuclear Station site in geography and urbanization, development of the proposed new units on the Perkins site would have similar socioeconomic impacts in most respects to building the two units on the Lee Nuclear Station site. Based on the analysis of project impacts presented in Section 4.4.2, of the 4613 peak workers approximately 3191 workers would migrate into the region with some workers bringing a family for a total in-migrating population of 4516 people. Considering that the maximum estimation of in-migrating population is less than 1 percent of the existing regional population, the review team expects the demographic impacts of building two units on the Perkins site would be minimal. Once the plant is operational, Duke estimates the workforce to be about 957 workers with an estimated 345 migrating into the region, similar to the Lee Nuclear Station site. Based on the information provided by Duke and the review team's independent evaluation, the review team concludes that the demographic impacts of building and operating two new nuclear units at the Perkins site would be minimal.

Economic Impacts on the Community

<u>Economy</u>

The local workforce is dominated by government, manufacturing, retail trade, and educational services. Agriculture represents 45 percent (76,295 ac) of total Davie County land area (Duke 2009c). Davie County's 2009 labor force was 20,778 with an unemployment rate of 11.4 percent. Forsyth County's 2009 labor force was 172,845 with an unemployment rate of 9.7 percent. The 2006 unemployment rates for Davie and Forsyth Counties were 4.2 percent and 4.3, respectively (BLS 2011a). The significant increase in unemployment rates between 2006 and 2009 is attributed to the recent economic downturn afflicting much of the country.

The wages and salaries of the project workforce would have a multiplier effect that would result in increases in business activity, particularly in the retail and service sectors. This multiplier effect would have a positive impact on the business community and could provide opportunities for new businesses and increased employment opportunities for local residents. The review team expects most indirect jobs created in the region would be allocated to residents in the region. Expenditures made by the indirect workforce would also strengthen the regional economy. Because the review team assumes the economic impacts of the Lee Nuclear Station site (in Sections 4.4.3.1 and 5.4.3.1) also apply to the Perkins site, the review team concludes the impact of these new indirect jobs would constitute a small percentage of the total number of jobs in Davie and Forsyth Counties and would have a minimal and beneficial economic impact.

Taxes

If the proposed nuclear station was located at the Perkins site, Duke would pay property taxes according to North Carolina law. The amount of property taxes paid is unknown because it relies on several parameters such as the assessed value, millage rates, and annual depreciation. Duke owns the McGuire Nuclear Station in Mecklenburg County, North Carolina and paid $8.8 million in property taxes in 2008. If Duke pays a similar amount of taxes at the Perkins site as it does for the McGuire Nuclear Station, the impact on taxes would be substantial given the relatively small tax base of Davie County, but minimal throughout the remainder of the 50-mi region.

Infrastructure and Community Services

Traffic

Davie County is served by several U.S. highways. Mocksville is an important center for highway transportation because US-158, US-64, and US-601 all meet there. These three highways join I-40 approximately 9 mi northwest of the Perkins site and I-85 is located approximately 9 mi southeast of the site. The Perkins site is accessible from State Route 801 (NC 801), which connects to US-601 and US-64 (Duke 2009c). The development of a nuclear facility on the Perkins site would require road modifications (e.g., road widening and site access roads). A railroad spur would need to be built for the transport of materials and equipment to the site, and there is residential area near the site (Duke 2009c). Given the large number of additional vehicles added to the roads during peak construction, the review team expects traffic-related impacts from building the plant at the Perkins site would be noticeable but not destabilizing on roads near the site. The review team expects traffic-related impacts from operations of a nuclear power station on the Perkins site to be minimal due to the smaller workforce needed.

Housing

Based on the analysis in Section 4.4.2, approximately 3191 workers would migrate into the region during the peak employment period of the building phase. Later, approximately

345 operations workers would migrate into the region by the time the plant becomes operational. The 2006–2010 American Community Survey (ACS) estimate for Davie County indicated a total housing stock of 17,923 units, of which 2091 were vacant (USCB 2010e). Forsyth County had 154,153 housing units of which approximately 17,541 were vacant (USCB 2010e). The review team expects that the in-migrating construction workforce could be absorbed fairly easily into the existing housing stock in the region and the impact would be minimal.

Based on the information provided by Duke and the review team's independent evaluation, the review team concludes that traffic-related and housing impacts of building two new nuclear units at the Perkins site would be minor across the region with the exception of noticeable, but not destabilizing, traffic-related impacts on roads closest to the site. Because of the much lower number of operations-related workers relative to workers during the building phase, the review team determined traffic-related and housing impacts from operations would be minimal.

Recreation

No recreational facilities exist within the site boundary; however, the Perkins State Game Lands are within the boundaries of one of the reservoirs. Recreational activities near the Perkins site include golf, camping, and other outdoor activities (Davie County Chamber of Commerce 2013). Boone's Cave State Park, Perkins State Game Preserve, and Alcoa State Game Lands are all located within 5 mi of the Perkins site. Similar to each alternative site and the proposed site, the supplemental reservoirs would not be available for public recreation. Duke has not indicated that recreational activities near the Perkins site would be limited during building or operation of a nuclear project. However access to the Perkins State Game Lands may be restricted for the life of the project. Other recreational areas are far enough offsite not to be affected. Therefore, the review expects impacts on recreation would be minimal for both building and operating two new nuclear units at the Perkins site.

Public Services

The influx of construction workers and plant operations staff settling in the region could affect local municipal water and water-treatment facilities, police, fire, medical, and other social services in the area. Davie County has two water suppliers and one wastewater-treatment plant. The impact on public services would depend on the infrastructure that is developed on the site as well as the location in which the in-migrating workforce chooses to live. The in-migrating workers represent a small portion of the total populations of Davie and Forsyth Counties and the review team expects they would have a minimal impact on public services.

Education

Davie County has 12 schools: six elementary schools, three middle schools, and three high schools. The kindergarten through 12th grade enrollment for the 2010-2011 school year was

6786 students (NCES 2013). Forsyth County has 90 schools in the county's district with a 2010-2011 kindergarten through 12th grade student enrollment of 55,232 and 6 special needs schools and academies with an additional enrollment of 1975. The review team expects, based upon the same underlying assumptions that governed the analysis for the proposed Lee Nuclear Station site, that approximately 400 students would move into the two-county area during the peak employment period for building activities. Assuming equal distribution of those students between counties, 200 additional students in each school district would represent a less than 5 percent increase in the student body population. Therefore, the review team determined building a nuclear facility on the Perkins site would have a minimal impact on education, and that the much smaller operations workforce would also have a minimal impact on education. Based on the information provided by Duke and the review team's independent evaluation, the review team concludes that public services and education impacts of building and operating two new nuclear units at the Perkins site would be minimal.

Summary of Building and Operation Impacts

Physical impacts on workers and the general public include impacts on existing buildings, transportation, aesthetics, noise levels, and air quality. Social and economic impacts span issues of demographics, economy, taxes, infrastructure, and community services. In summary, based on information provided by Duke and the review team's independent evaluation, the review team concludes that the adverse impacts on socioeconomics of building and operating a new nuclear plant at the Perkins site would be minor for most of the region but could be noticeable, but not destabilizing, for Davie County in terms of traffic-related impacts during peak project employment. During operations, traffic-related impacts are expected to be minimal. Impacts on aesthetics would be noticeable. The impacts on the Davie County tax base during operations likely would be substantial and beneficial; however only minimal beneficial tax impacts would result in the rest of the region.

Cumulative Impacts

The projects identified in Table 9-6, particularly the future urbanization of the region, have contributed or would contribute to the demographics, economic climate, and community infrastructure of the region and generally result in increased urbanization and industrialization. Because the projects within the review area identified in Table 9-6 would be consistent with applicable land-use plans and control policies, the review team considers the cumulative socioeconomic impacts from the projects to be minimal.

For the analysis of socioeconomic impacts at the Perkins site, the geographic area of interest is considered to be the 50-mi region centered on the Perkins site, with special consideration of Davie and Forsyth Counties, where the review team expects socioeconomic impacts to be the greatest.

The Perkins site is located in southeastern Davie County on the Davie and Davidson County border. The employment in the area near the Perkins site is a mixture of government, manufacturing, retail trade, and educational services. The nearest towns are Mocksville (population 4952) and Bermuda Run (population 1667) (USCB 2010ee), which are located to the west and the north of the site, respectively. The large metropolitan area of Winston-Salem is located northeast of the Perkins site.

The cumulative impact analysis considers other past, present, and reasonably foreseeable future actions that could contribute to the cumulative socioeconomic impacts on a given region, including other Federal and non-Federal projects and the projects listed in Table 9-6. Adverse cumulative impacts would include physical impacts (on workers and the local public, buildings, roads, and aesthetics), demographic impacts, and impacts on local infrastructures and community services (transportation; recreation; housing; water and wastewater facilities; police, fire, and medical services; social services; and education).

Because most projects described in Table 9-6 do not include any significant reasonably foreseeable changes in socioeconomic impacts within 50 mi of the Perkins site, the review team determined there would be no significant additional cumulative socioeconomic impacts in the region from those activities. Regional planning efforts and associated demographic projections available at a reconnaissance level formed the basis for the review team's assessment of reasonably foreseeable future impacts. Any economic impacts associated with activities listed in Table 9-6 would have been considered as part of the socioeconomic baseline.

The review team concludes that building two nuclear units at the Perkins site, in addition to other past, present, and reasonably foreseeable future projects would have cumulative economic impacts on the community that would be beneficial and SMALL with the exception of Davie County, which would see a LARGE and beneficial cumulative impact on taxes. The cumulative infrastructure and community services impacts would be SMALL with the exception of a MODERATE and adverse cumulative impact on traffic near the Perkins site. The cumulative physical impacts would be SMALL with the exception of a MODERATE and adverse impact on aesthetics near the site. The cumulative impacts of demography would be SMALL. Building and operating the proposed units at the Perkins site would be a significant contributor to the LARGE and beneficial economic impact on taxes in Davie County and also to the MODERATE and adverse impact on infrastructure and community services related to traffic near the site and the MODERATE physical impact on aesthetics.

9.3.3.6 Environmental Justice

The 2006–2010 ACS5-year population estimates at the census block groups level were used to identify minority and low-income populations in the region, and used the same sources and methodology explained in Section 2.6.1 for the proposed site, including a closer look at potential areas of interest using a series of health and physical considerations. There were 1840 census block groups within the 50-mi region (USCB 2011c). Approximately 490 of these census block groups were classified as having aggregate minority populations of interest and 366 were classified as African American populations of interest. The review team also identified 17 census block groups that had an Asian, 1 block group with a Native Hawaiian or Pacific Islander, 54 with “other” race, and 118 with Hispanic populations of interest. Davie County did not have any census block groups with minority populations of interest. There were 190 census block groups classified as having low-income populations of interest in the 50-mi region, none of which were in Davie County. Nearby Forsyth County had 49 census block groups with African American, 8 with “other” race, 143 with aggregate minority, and 23 with Hispanic populations of interest. There were 41 census block groups with low-income populations of interest. The nearest census block groups with minority and low-income populations of interest were located in Davidson and Rowan Counties. The review team did not identify any Native American communities or other minority communities with the potential for a disproportionately high and adverse impact due to their unique characteristics or practices. Figure 9-3 shows the geographic locations of the minority populations of interest within the 50-mi radius of the Perkins site, and Figure 9-4 shows the geographic locations of the low-income populations of interest within the 50-mi radius of the Perkins site.

Physical impacts from building activities (e.g., noise, fugitive dust, air emissions, traffic) attenuate rapidly with distance, topography, and intervening vegetation. Therefore, the review team determined that, given the distance from the Perkins site to the nearest populations of interest, there would be no physical impacts with a disproportionately high and adverse effect on minority or low-income populations. For the same reasons, the review team determined the operation of the proposed project at the Perkins site is also unlikely to have a disproportionately high and adverse impact on minority or low-income populations. Supplemental water reservoirs near the site would be needed, which would require acquiring private property from current residents and demolishing houses. New transmission-line corridors would be constructed to link the proposed units to the electric grid. Given the distance between the Perkins site and the location of minority and low-income populations of interest, impacts from the supplemental water reservoirs and transmission-line corridors would not disproportionately and adversely affect minority or low-income populations. See Sections 2.6, 4.5, and 5.5 for more information about environmental justice criteria and impacts.

In addition to environmental justice impacts from building and operations, the cumulative analysis considers other past, present, and reasonably foreseeable future actions that could contribute to disproportionately high and adverse impacts on minority and low-income populations, including other Federal and non-Federal projects and the projects listed in Table 9-6. For the analysis of environmental justice impacts at the Perkins site, the geographic area of interest is considered to be the 50-mi region centered on the Perkins site.

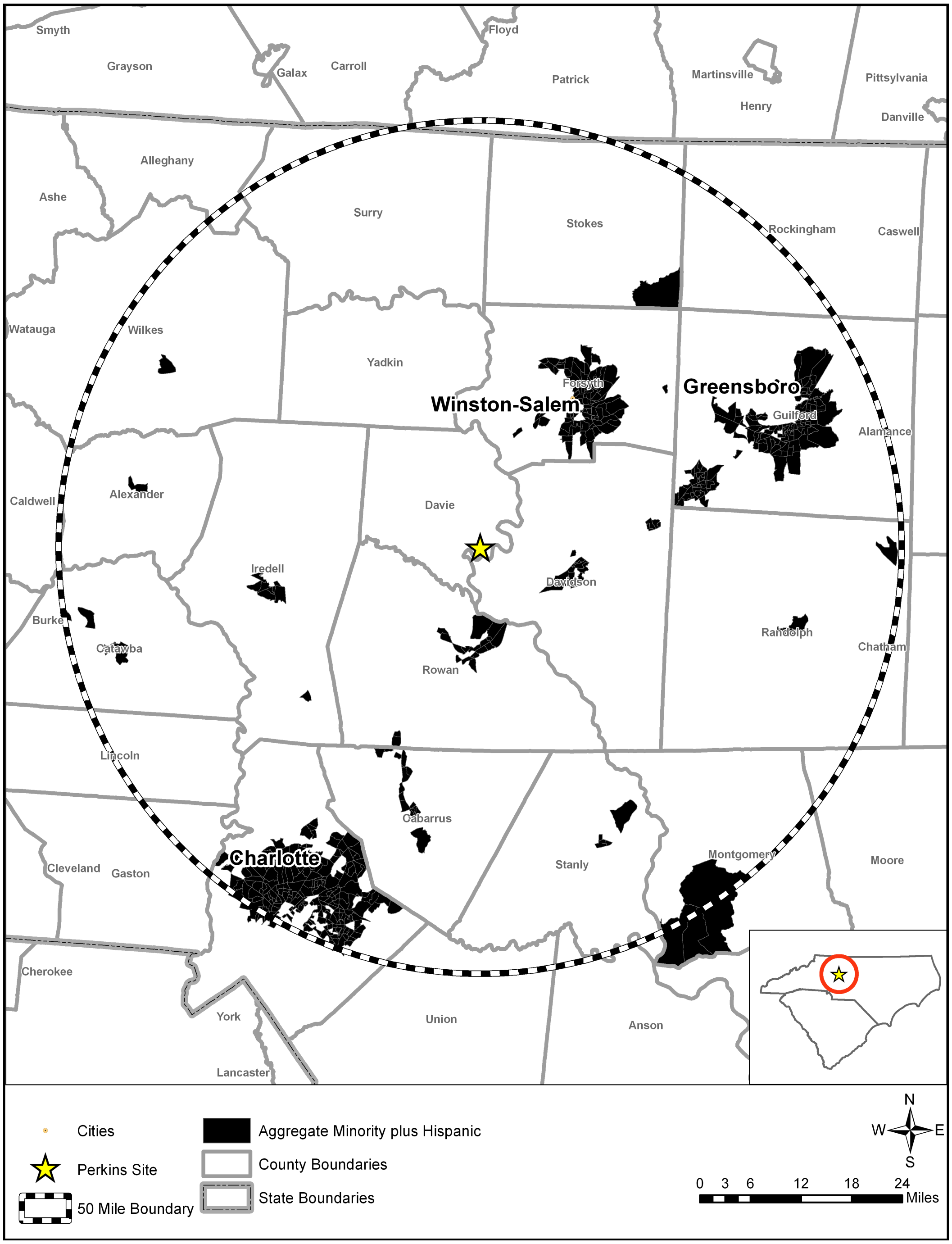

Figure 9-3. Aggregate Minority Populations in Block Groups that Meet the Environmental Justice Selection Criteria at the Perkins Site (USCB 2011c)

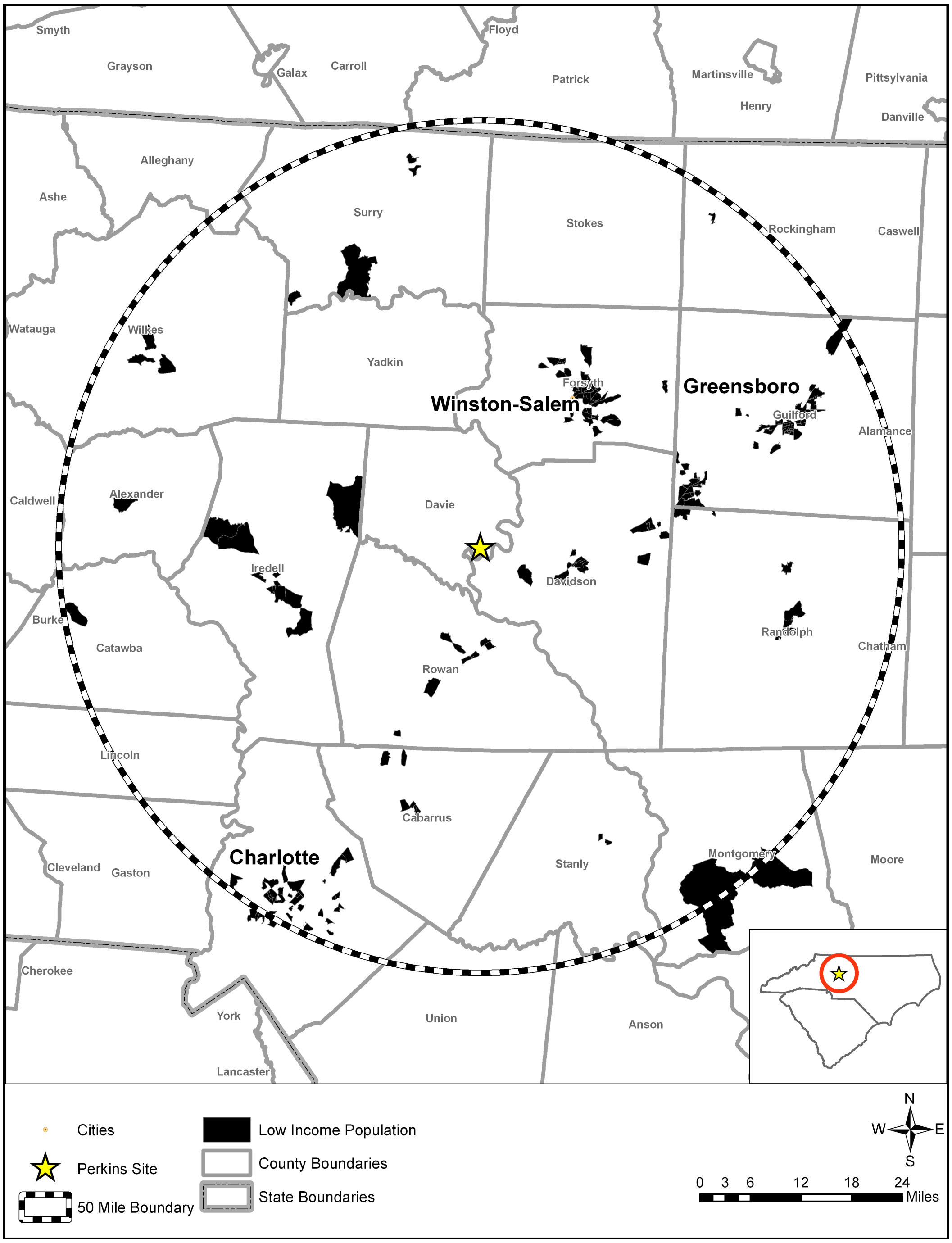

Figure 9-4. Low-Income Populations in Block Groups that Meet the Environmental Justice Selection Criteria at the Perkins Site (USCB 2011c)

The projects identified in Table 9-6 likely did not or would not contribute to environmental justice impacts of the region. Therefore, based on information provided by Duke and the review team's independent evaluation, the review team concludes there would not be any disproportionately high and adverse environmental justice cumulative impacts from the building and operation of two nuclear units at the Perkins site in addition to other past, present, and reasonably foreseeable future projects, and the cumulative environmental justice impacts would be SMALL.

9.3.3.7 Historic and Cultural Resources

The following analysis addresses impacts on historic and cultural resources from building and operating two new nuclear generating units at the Perkins site in Davie County, North Carolina. The analysis also considers other past, present, and reasonably foreseeable future actions that could cause cumulative impacts on cultural resources, including other Federal and non-Federal projects as listed in Table 9-6. For the analysis of cultural resources impacts at the Perkins site, the geographic area of interest is considered to be the onsite and offsite direct physical and indirect visual areas of potential effect (APEs) associated with the proposed undertaking. This includes direct physical APEs, defined as the onsite areas directly affected by site development and operation activities as well as offsite areas such as railroad corridors, transmission lines, and new reservoirs. Indirect visual APEs are also included and defined generally as a 1-mi radius buffer around the proposed direct physical APEs, which encompasses the approximate maximum distance from which tall structures could be seen.

Reconnaissance activities in a cultural resources review have particular meaning. Typically such activities include preliminary field investigations to confirm the presence or absence of historic properties or cultural resources. However, in developing this EIS, the review team relied upon reconnaissance-level information to perform the alternative sites evaluation in accordance with ESRP 9.3 (NRC 2000a). Reconnaissance-level information in this context is data that are readily available from agencies and other public sources. It can also include information obtained through site visits. To identify historic and cultural resources at the Perkins site, the review team relied on the following information:

- the Perkins Nuclear Station ER (Duke Power Company 1974d) and Lee Nuclear Station COL ER (Duke 2009c)
- an August 2010 tour of the Perkins site and visit to the Martin-Wall History Room at the Davie County Public Library, Mocksville, North Carolina (NRC 2010c)
- archival records searches and National Register listings provided by Duke (Duke 2010t)
- the National Park Service's listing of properties on the National Register of Historic Places (National Register) (NPS 2011b).

Site Description

Historically, the Perkins site and vicinity were largely undisturbed and contained intact archaeological resources associated with the past 10,000 years of human settlement. Cotton cultivation also occurred historically in some areas. Several cultural resources investigations were conducted at the site and vicinity in the 1970s during preparations for the Perkins Nuclear Station (Duke Power Company 1974d, Duke 2010t) and more than 80 archaeological sites were identified.

Duke completed a records search at the North Carolina Office of the State Archaeologist to assemble a list of previously recorded cultural resources and historic properties listed or eligible for listing on the National Register that could be affected if the Perkins site was selected for nuclear plant development (Duke 2010t). According to the search results, at least six prehistoric archaeological sites and one historic cemetery are located within the direct physical APE for the proposed plant site. At least four prehistoric archaeological sites and one National Register-eligible historic architectural property may be directly affected by proposed offsite reservoirs. Visual impacts in the indirect visual APEs within 1 mi of the direct APEs could affect 5 historic cemeteries, 4 National Register-listed historic properties, 8 properties and 2 historic districts evaluated as potentially eligible for nomination to the National Register, and at least 64 unassessed historic architectural resources. Records searches were not completed for the proposed new offsite railroad line or transmission lines.

Most of the archaeological sites previously recorded in the direct physical APEs at the Perkins site and in the direct physical APEs for proposed offsite reservoirs were evaluated in the 1970s (using approved methodologies of the time) and found not eligible for nomination to the National Register (Duke Power Company 1974d). It is also likely that the majority of historic architectural resources located in the indirect visual APEs for the plant and reservoirs are ineligible for nomination. However, direct physical impacts would be unavoidable at one historic cemetery, protected by State law, in the direct, physical APE and one National Register-eligible property located in the direct physical APE of a proposed reservoir. Indirect visual impacts associated with proposed new reservoirs would also be unavoidable at four National Register-listed properties as well as eight properties and two historic districts potentially eligible for National Register listing.

Building and Operation Impacts

In the event that the Perkins site was chosen for the proposed project, the review team assumes that Duke would employ the same methods for identifying and assessing impacts on historic properties and cultural resources as those used during assessments at the Lee Nuclear Station site and associated developments. This would include field investigations and coordination with the North Carolina State Historic Preservation Office (SHPO), interested American Indian Tribes, and the public, which would be conducted before the initiation of any ground-disturbing activities. The results of these investigations and consultations would be used in the site planning process to avoid or mitigate impacts and develop protective measures for any significant resources, such as those already listed on the National Register. Duke has committed to this approach for the Lee Nuclear Station site and the review team assumes that Duke would employ the same methods at alternative sites, if chosen for the proposed project (Duke 2009j). Initial archival searches indicate that appropriate mitigations would need to be developed for at least 1 historic cemetery in the direct physical APE for the Perkins site; 1 National Register-eligible historic property in the direct physical APE of an offsite reservoir; and for at least 12 National Register-listed or eligible properties in indirect visual APEs for the proposed reservoirs. Additional important historic and cultural resources may also be discovered during new surveys in all APEs. As a result, impacts on cultural resources due to site development and building activities could be noticeable, but not destabilizing with appropriate mitigations implemented.

Impacts on historic and cultural resources from operation of the two new nuclear units at the Perkins site as well as parallel and related operations at offsite components such as the new reservoirs, railroad line, and transmission-line corridors would be possible. The review team assumes that Duke Energy's corporate policy for consideration of cultural resources and associated procedures in the event of an unanticipated discovery of cultural resources would apply to operations at the Perkins site and offsite areas (Duke 2009j). Further, the review team assumes that Duke would negotiate an agreement and associated cultural resources management plan for the Perkins site with the North Carolina SHPO, the USACE, and interested American Indian Tribes similar to efforts completed for the Lee Nuclear Station site (USACE et al. 2013). Under consistent application of Duke Energy's corporate policy for cultural resources and an agreement and cultural resources management plan specific to the Perkins site, impacts on historic and cultural resources due to operations would be negligible.

Cumulative Impacts

The geographic area of interest for cumulative impacts on historic and cultural resources at the Perkins site corresponds to the onsite and offsite direct (physical) and indirect (visual) APEs defined for the site. Past actions in the geographic area of interest that have affected historic and cultural resources in a manner similar to those associated with the building and operation of the two new units and other project components include limited residential development and attendant transportation and utility development, and it is reasonable to assume that these developments will continue. This future urbanization of the area identified in Table 9-6 may affect historic and cultural resources in the geographic area of interest. No other activities identified in Table 9-6 are located in the geographic area of interest and none would contribute to cumulative impacts on historic and cultural resources in a manner similar to the impacts associated with the building and operation of the two new nuclear units.

Summary

Cultural resources are non-renewable; therefore, the impact of destruction of cultural resources is cumulative. Based on the information provided by Duke and the review team's independent evaluation, the review team concludes that the cumulative impacts from building and operating two new nuclear units on the Perkins site and from future urbanization of the area would be MODERATE. The incremental contribution of building and operating the two new units and associated plant components would be significant to these cumulative impacts given the historic properties and cultural resources known to exist within the onsite and offsite direct and indirect APEs and the geographic area of interest.

9.3.3.8 Air Quality

The following impact analysis includes impacts on air quality from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect air quality, including other Federal and non-Federal projects listed in Table 9-6. The air-quality impacts related to building and operating a nuclear facility at the Perkins site would be similar to those at the Lee Nuclear Station site.

The Perkins site is located in Davie County, North Carolina, which is part of the Northern Piedmont Intrastate Air Quality Control Region (40 CFR 81.150). The geographic area of interest for this resource area is the 50-mi radius of the Perkins site, which includes Davie County. Designations of attainment or nonattainment are made on a county-by-county basis. Davie County is designated as unclassifiable or in attainment for all criteria pollutants for which National Ambient Air Quality Standards (NAAQS) have been established (40 CFR 81.334). Criteria pollutants include ozone, PM, CO, No_x, SO_2, and lead. Davie County came into attainment with the 8-hour ozone standard on April 15, 2008, and is, therefore, considered a maintenance area for ozone (40 CFR 81.334). An applicability analysis would need to be performed per 40 CFR Part 93 Subpart B to determine if a general conformity determination is needed. The closest Class 1 Federal Area (i.e., Linville Gorge Wilderness Area) is more than 50 mi from the Perkins site and it would, therefore, not likely be affected by minor source emissions from the site. Class I areas are considered of special national or regional natural, scenic, recreational, or historic value and are afforded additional air quality protection.

As described in Section 4.7, emissions of criteria pollutants from building the two units are expected to be temporary and limited in magnitude. As discussed in Section 5.7, emissions criteria pollutants from operations would be primarily from the intermittent use of standby diesel generators and pumps. Given the temporary air emissions from construction and intermittent air emissions from operation, and that Davie County is currently designated as being unclassified or in attainment for criteria pollutants, the review team concludes the impacts from building and operating two new nuclear units on criteria pollutants would be minimal.

Cumulative impacts on air quality resources are estimated based on the information provided by Duke and the review team's independent evaluation. There are no projects listed in Table 9-6 that are major sources of NAAQS criteria pollutants within Davie County. Other past, present, and reasonably foreseeable activities exist in the geographic area of interest that could affect air quality resources. The impacts on criteria pollutants in Davie County from emissions of effluents from the Perkins site and other projects and activities within the 50-mi region would not be noticeable.

The greenhouse gas emissions from two nuclear units at the Perkins site would be the same as those analyzed in Chapters 4, 5, and 6 for the Lee Nuclear Station site. The cumulative impacts of greenhouse gas emissions related to nuclear power are discussed in Section 7.6. The impacts of the emissions are not sensitive to location of the source. Consequently, the conclusion in Section 7.6—national and worldwide impacts of greenhouse gas emissions are noticeable but not destabilizing—is applicable to two AP1000 reactors located at the Perkins site.

The review team concludes that the cumulative impacts, including those from other past, present, and reasonably foreseeable future actions on air quality resources in the geographic area of interest would be SMALL for criteria pollutants and MODERATE for greenhouse gas emissions. The incremental contribution of impacts on air quality resources from building and operating two units at the Perkins site would not be significant to the MODERATE air-quality impact from greenhouse gas emissions.

9.3.3.9 Nonradiological Health Impacts

The following analysis considers nonradiological health impacts from building and operating two new nuclear units at the Perkins site. Nonradiological health impacts at the Perkins site are estimated based on information provided by Duke and the review team's independent evaluation. The analysis also includes past, present, and reasonably foreseeable future actions that could contribute to cumulative nonradiological health impacts onsite workers and the public, including other Federal and non-Federal projects and the projects listed in Table 9-6. For the analysis of nonradiological health impacts at the Perkins site, the geographic area of interest is the immediate vicinity of the Perkins site and the associated transmission-line corridors. This area of interest is based on the localized nature of nonradiological health impacts.

Building activities with the potential to affect the health of members of the public and construction workers at the Perkins site include exposure to dust, vehicle exhaust, and emissions from construction equipment; noise; occupational injuries; and the transport of construction materials and personnel to and from the site. The operations-related activities that may affect the health of members of the public and workers include exposure to etiological (disease-causing) agents, noise, electromagnetic fields (EMFs), occupational injuries, and impacts from the transport of workers to and from the site.

Building Impacts

Nonradiological health impacts on construction workers and members of the public from building two new nuclear units at the Perkins site would be similar to those evaluated in Section 4.8 for the proposed Lee Nuclear Station site. Duke would comply with applicable Federal and State regulations on air quality and noise during the site preparation and building phase. The frequency of construction worker accidents would not be expected to be different from the frequency of accidents estimated for the Lee Nuclear Station site (discussed in Section 4.8).

Section 4.8.3 concludes that impacts on nonradiological health from the transport of construction workers and materials to and from the Lee Nuclear Station site would be minimal. Transportation impacts would be 24 percent lower for the Perkins site than for the Lee Nuclear Station site. This decrease is due to the difference in the average State-specific fatality rates used for construction workers in North Carolina and South Carolina. Nonradiological health impacts from transportation at the Perkins site would be minimal.

The Perkins site is located in a rural area and nonradiological health impacts from building would likely be negligible on the surrounding populations, which are classified as medium- and low-population areas. The review team concludes that nonradiological health impacts on construction workers and the public from building two new nuclear units, associated transmission lines, and three supplemental cooling-water reservoirs at the Perkins site would be minimal.

Operational Impacts

Nonradiological health impacts from operation of two new nuclear units on members of the public and workers at the Perkins site would be similar to those evaluated in Section 5.8 for the proposed Lee Nuclear Station site. Occupational health impacts on workers (e.g., falls, electric shock, or exposure to other hazards) at the Perkins site would likely be the same as those evaluated for workers at the proposed Lee Nuclear Station site. Exposure to the public from waterborne etiological agents at the Perkins site would be similar to the types of exposures evaluated in Section 5.8.1 for the Lee Nuclear Station site. The operation of new nuclear units at the Perkins site would not likely lead to an increase in waterborne diseases in the vicinity, due to the thermal mixing promoted by the discharge pipe and diffuser at the proposed plant, and temperature limitations prescribed by the plant NPDES permit on thermal discharge. Noise and EMF exposure would be monitored and controlled in accordance with applicable Occupational Safety and Health Administration (OSHA) regulations. Effects of EMF on human health would be controlled and minimized by conformance with National Electrical Safety Code (NESC) criteria.

Transportation of operations workers to and from the Perkins site would result in about a 2 percent increase in traffic fatalities in Davie County. This difference is solely because of differences in the average State-specific fatality rates used for operations workers and the county-specific baseline annual fatalities. Because these increases are small relative to the baseline traffic fatalities (i.e., before the new units are constructed), the review team concludes that the impacts of transporting construction materials and personnel to and from the Perkins site would be minimal. The review team concludes that nonradiological health impacts onsite workers and the public from the operation of the two nuclear units at the Perkins site would be minimal.

Cumulative Impacts

There are no past or current actions within the geographic area of interest that would have similar nonradiological health impacts as building and operating two nuclear units at the Perkins site. Proposed future actions that could cumulatively contribute to nonradiological health impacts at the Perkins site include the future development or upgrade of transmission lines and future urbanization throughout the immediate vicinity of the site.

The review team is also aware of the potential climate changes that could affect human health—a recent compilation of the state of knowledge in this area (GCRP 2009) has been considered in the preparation of this EIS. Projected changes in the climate for the southeastern region during the life of the proposed nuclear station include a small increase in average temperature; a decrease in precipitation in winter, spring, and summer; and a small increase in precipitation in fall (GCRP 2009). This may result in a small, gradual increase in river water temperature, which may alter the presence of microorganisms and parasites in the Yadkin River. While the changes attributed to climate change in these studies (GCRP 2009) may not be insignificant on a national or global level, the review team did not identify anything that would alter its conclusion regarding the presence of etiological agents or change the incidence of waterborne diseases in the vicinity of the Perkins site. The review team concludes that the cumulative impacts on nonradiological health from building two new nuclear units, associated transmission lines, and offsite reservoirs at the Perkins site would be minimal.

Summary

Nonradiological health impacts from building and operating two new units at the Perkins site are estimated based in the information provided by Duke and the review team's independent evaluation. The review team concludes that nonradiological health impacts on members of the public and construction workers from building two new nuclear units, associated transmission lines, and offsite reservoirs at the Perkins site would be minimal. The review team also expects that the occupational health impacts on members of the public and operations workers from two new nuclear units at the Perkins site would be minimal. Finally, the review team concludes that cumulative nonradiological health impacts from related past, present, and future foreseeable actions in the geographic area of interest would be SMALL. As discussed in Section 5.8, the NRC staff has not come to a conclusion on the chronic impacts of EMFs.

9.3.3.10 Radiological Health Impacts of Normal Operations

The following impact analysis includes radiological impacts on the public and workers from building activities and operations for two nuclear units at the Perkins alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health, including other Federal and non-Federal projects and the projects listed in Table 9-6. As described in Section 9.3.3, the Perkins site is a greenfield site; there are currently no nuclear facilities on the site. The geographic area of interest is the area within a 50-mi radius of the Perkins site. The only facility potentially affecting radiological health within this geographic area of interest is the existing McGuire Nuclear Station. In addition, medical, industrial, and research facilities that use radioactive material are likely to be within 50 mi of the Perkins site.

The radiological impacts of building and operating the proposed two AP1000 units at the Perkins site include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways would result in low doses to people and biota offsite that would be well below regulatory limits. The impacts are expected to be similar to those at the Lee Nuclear Station site.

The radiological impacts of McGuire Nuclear Station Units 1 and 2 include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways result in low doses to people and biota offsite that are well below regulatory limits as demonstrated by the ongoing radiological environmental monitoring program conducted around McGuire Nuclear Station. The NRC staff concludes that the dose from direct radiation and effluents from medical, industrial, and research facilities that use radioactive material would be an insignificant contribution to the cumulative impact around the Perkins site. This conclusion is based on data from the radiological environmental monitoring programs conducted around currently operating nuclear power plants. Based on the information provided by Duke and the NRC staff's independent analysis, the NRC staff concludes that the cumulative radiological impacts from building and operating the two proposed AP1000 units and other existing and planned projects and actions in the geographic area of interest around the Perkins site would be SMALL.

9.3.3.11 Postulated Accidents

The following impact analysis includes radiological impacts from postulated accidents from the operation of two nuclear units at the Perkins alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health from postulated accidents, including other Federal and non-Federal projects and the projects listed in Table 9-6. As described in Section 9.3.3, the Perkins site is a greenfield site; there are currently no nuclear facilities at the site. The geographic area of interest considers all existing and proposed nuclear power plants that have the potential to increase theprobability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Perkins alternative site. Facilities potentially affecting radiological accident risk within this geographic area of interest are the existing H.B. Robinson Unit 2, Catawba Units 1 and 2, McGuire Units 1 and 2, and Harris Unit 1. In addition, two units (Units 2 and 3) have been proposed for the Harris site.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of design basis accidents (DBAs) at the Lee Nuclear Station site would be minimal for AP1000 reactors. DBAs are addressed specifically to demonstrate that a reactor design is robust enough to meet NRC safety criteria. The AP1000 design is independent of site conditions, and the meteorology of the Perkins alternative and Lee Nuclear Station sites are similar; therefore, the NRC staff concludes that the environmental consequences of DBAs at the Perkins alternative site would be minimal.

Assuming the meteorology, population distribution, and land use for the Perkins alternative site are similar to the proposed Lee Nuclear Station site, risks from a severe accident for an AP1000 reactor located at the Perkins alternative site are expected to be similar to those analyzed for the proposed Lee Nuclear Station site. The risks for the proposed Lee Nuclear Station site are presented in Tables 5-14 and 5-15 and are well below the median value for current-generation reactors. In addition, as discussed in Section 5.11.2, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028). For existing plants within the geographic area of interest (H.B. Robinson Unit 2, Catawba Units 1 and 2, McGuire Units 1 and 2, and Harris Unit 1), the Commission has determined that the probability-weighted consequences of severe accidents are small (10 CFR Part 51, Appendix B, Table B-1). Finally, according to the ER for Harris (PEC 2009), the risks from proposed Units 2 and 3 would also be well below risks for current-generation reactors and would meet the Commission's safety goals. On this basis, the NRC staff concludes that the cumulative risks from severe accidents at any location within 50 mi of the Perkins alternative site would be SMALL.

9.3.4 The Keowee Site

This section covers the staff's evaluation of the potential environmental impacts of siting two new nuclear reactors at the Keowee site located in Oconee County, South Carolina. The Keowee alternative site is adjacent to the existing Oconee Nuclear Station, and would share many of the same resources and services due to its proximity. The following sections describe a cumulative impact assessment conducted for each major resource area. The specific resources and components that could be affected by the incremental effects of the proposed action if it were implemented at the Keowee site, and other actions in the same geographic area were considered. This assessment includes the impacts of NRC-authorized construction, operations, and preconstruction activities. Also included in the assessment are other past, present, and reasonably foreseeable Federal, non-Federal, and private actions that could have meaningful cumulative impacts when considered together with the proposed action if implemented at the Keowee site. Other actions and projects considered in this cumulative analysis are described in Table 9-10.

Table 9-10. Past, Present, and Reasonably Foreseeable Projects and Other Actions Considered in the Keowee Alternative Site Cumulative Analysis

Project Name	Summary of Project	Location	Status
Nuclear Projects			
Oconee Nuclear Station Units 1, 2, and 3	Nuclear power generating plant with three units (846 MW(e) each)	Adjacent to the Keowee site	Oconee's three units are currently operational and are licensed through February 6, 2033, October 6, 2033, and July 19, 2034 (NRC 2012a)
Virgil C. Summer Nuclear Station (VCSNS) Unit 1	Nuclear power generating plant with one unit (966 MW(e))	Approximately 95 mi east-southeast of the Keowee site	VCSNS Unit 1 is currently operational and is licensed through August 6, 2042 (NRC 2012a)
VCSNS Units 2 and 3	Nuclear power generating plant with two Westinghouse AP1000 pressurized water reactors	Approximately 95 mi east-southeast of the Keowee site	Proposed operation would begin in 2016 and 2019 (NRC 2011f). COLs issued March 30, 2012 (NRC 2012a).
Vogtle Electric Generating Plant (VEGP)	Nuclear power generating plant with two units, VEGP 1 (1109 MW(e)) and VEGP 2 (1127 MW(e))	Approximately 130 mi southeast of the Keowee site	VEGP's two units are currently operational and are licensed through January 16, 2047 and February 9, 2049 (NRC 2012a)
VEGP Units 3 and 4	Nuclear power generating plant with two 1117-MW(e) Westinghouse AP1000 pressurized water reactors	Approximately 130 mi southeast of the Keowee site	Combined licenses and limited work authorizations issued February 10, 2012 (NRC 2012a, 2012k). Proposed operation would begin in 2016 for Unit 3 and 2017 for Unit 4.

Table 9-10. (contd)

Project Name	Summary of Project	Location	Status
Nuclear Fuel Services, Inc. Erwin Plant	Prepares highly enriched uranium and fabricates fuel for use in the DOE Naval Reactor Program. Also recovers highly enriched uranium from scrap, and blends high-enriched uranium with natural uranium to produce low-enriched uranium.	Erwin, Tennessee, approximately 96 mi north-northeast	Operational. License SNM-124 renewed August 2, 2012. Licensed through August 31, 2037 (NRC 2012j).
Other Energy Facilities			
John Rainey Generating Station	A 1095-MW, six-unit natural gas-fired peaking facility	Approximately 30 mi south of Keowee site	Operational (EPA 2010an; Santee Cooper 2013)
Lee Steam Station	A three-unit, 370-MW coal-fired power plant operated by Duke Energy	Approximately 29 mi east-southeast of the Keowee site	Operational (Duke Energy 2010p)
Hartwell Energy Facility	A two-unit, 360-MW natural-gas-fired facility operated by operated by Oglethorpe Power	In Georgia, approximately 31 mi south of the Keowee site	Operational (Oglethorpe Power 2010)
Plant Carl	A 25-MW generating plant fueled by wood and poultry waste	In Georgia, approximately 37 mi southwest of the Keowee site	Proposed by Earth Resources, Inc.(GDNR 2009)
Urquhart Station	A five-unit, 650-MW fossil-fueled power plant operated by South Carolina Electric and Gas	Approximately 110 mi southeast of the Keowee site	Operational (SCE&G 2009a)
Various small-scale fossil and cogeneration generating facilities	Fossil fuel-fired and cogeneration facilities	In Georgia, North Carolina, and South Carolina throughout the 50-mi region	Operational
Hydroelectric Energy Facilities			
Keowee Hydroelectric Generating Plant	A 158-MW hydroelectric facility operated by Duke Energy	Approximately 1 mi north of the Keowee site	Operational (Duke Energy 2010q)

Table 9-10. (contd)

Project Name	Summary of Project	Location	Status
Jocassee Hydroelectric Station	A four-unit 610-MW pumped-storage hydroelectric facility operated by Duke Energy	On the Keowee River approximately 12 mi north of the Keowee site	Operational (Duke Energy 2010r)
Bad Creek Hydroelectric Station	A four-unit 1065-MW pumped-storage hydroelectric facility operated by Duke Energy	Approximately 17 mi north-northwest of the Keowee site	Operational (Duke Energy 2011c)
Yonah Hydroelectric Plant	A 22.5-MW hydroelectric facility operated by Georgia Power	In Georgia, approximately 26 mi west of the Keowee site	Operational (Georgia Power 2010)
Tugalo Hydroelectric Plant	A 45-MW hydroelectric facility operated by Georgia Power	In Georgia, approximately 27 mi west of the Keowee site	Operational (Georgia Power 2010)
Tallulah Falls Hydroelectric Plant	A 72-MW hydroelectric facility operated by Georgia Power	In Georgia, approximately 29 mi west of the Keowee site	Operational (Georgia Power 2010)
Hartwell Dam and Lake	USACE dam with four 85-MW units and one 80-MW unit	On the Savannah River approximately 29 mi south of the Keowee site	Operational (USACE 2010a)
Nantahala hydro plants (including Thorpe)	11 hydroelectric generating plants with a total maximum capacity of 100 MW.	In North Carolina approximately 34-40 mi north-northwest of the Keowee site	Operational (Duke Energy 2011d)
Various small-scale hydroelectric projects located on dams, including Ware Shoals, Tennessee Creek, Pelzer Upper and Lower, Terrora and Tuckasegee projects	Run-of-river and dam storage hydroelectric projects ranging from 1-20 MW	In Georgia and South Carolina throughout the 50-mi region	Operational (USSD 2010)
Other Energy Projects			
DOE Savannah River Site	Research and industrial complex	Approximately 126 mi southeast of the Keowee site	Operational (DOE 2009c)

Table 9-10. (contd)

Project Name	Summary of Project	Location	Status
Energy Efficiency and Conservation Block Grant (EECBG) for City of Clemson	$78,000 funded to improve energy efficiency and conservation		In progress (ARRA 2011)
EECBG Grant for City of Easley	$203,000 funded to improve energy efficiency and conservation	16 mi from Keowee site	In progress (ARRA 2011)
State Energy Program Grant	$122,000 funded to public school districts, public colleges/ universities, and state agencies for improving EE	12.3 mi from Keowee site	In progress (ARRA 2011)
Transportation Projects			
South Carolina Strategic Corridor System Plan	Strategic system of corridors forming the backbone of the State's transportation system	Statewide	Planning document with no explicit schedules for projects; however, many strategic corridors coincide with routes that would/could be used for development at the Keowee site.
U.S. Department of Transportation (USDOT) Grant	$2.5 million funded to improve public transportation through purchasing new buses as well as software/ hardware for technology upgrades for all rural transit providers	Within 10 mi of the Keowee site	In progress (ARRA 2011)
Highway Infrastructure USDOT Grants	$4.6 million funded to improve highway infrastructure as well as enhance sidewalks	Within 15 mi of the Keowee site	Complete (ARRA 2011)
Other Facilities			
Fabric Mills including Milliken, Hollingsworth, and Alice Manufacturing	Fabric and yarn manufacture	Throughout the 50-mi region	Operational (EPA 2010ao)

Table 9-10. (contd)

Project Name	Summary of Project	Location	Status
Honeywell Nylon	Nylon and resin manufacture	In Anderson and Clemson, SC	Operational (EPA 2010ao)
Westpoint Stevens – Clemson Facility	Fabric mill	Approximately 10 mi south of Keowee	Operational (EPA 2011g)
BASF Corporation	Inorganic chemicals and secondary smelting of non-ferrous metals	Approximately 10 mi south-southwest of Keowee site	Operational (EPA 2011h)
Ryobi Motor Products	Power-driven hand tool manufacture	Approximately 14 mi northeast of the Keowee site	Operational (EPA 2010ao)
Jocassee Gorges Management Area	43,500 ac of land managed primarily as a natural area	Approximately 15 mi north of Keowee	Operational (SCDNR 2011e)
Michelin Manufacturing	Tires and rubber products	In Silver Springs, Starr and Greenville, SC	Operational (EPA 2010ao)
Parks and National Forests			
Sumter National Forest	371,000-ac national forest	Throughout 40- to 50-mi region	Currently managed by U.S. Forest Service (USFS 2004a)
Chattahoochee – Oconee National Forests	750,000-ac Chattahoochee National Forest, and 115,000-ac Oconee National Forest	Throughout 40- to 50-mi region	Currently managed by U.S. Forest Service (USFS 2004b). Recent land transfers have added additional acreage to the managed forest (USFS 2010b). Development likely limited in these areas.
Mile Creek County Park	County park offers camping, picnic area, swimming, and boating	Approximately 5 mi north of Keowee site	Operational (Oconee County 2011)

Table 9-10. (contd)

Project Name	Summary of Project	Location	Status
Other State parks, forests and wilderness areas	Numerous State Parks, Wildlife Management Areas, and Wilderness Areas including Tallulah Gorge State Park, Jocassee Gorges Management Area, Table Rock State Park, and Mountain Bridge Wilderness Area	Throughout the 50-mi region	Development likely limited in these areas.
Wastewater-Treatment Facilities			
Greenville/Adkins Water Treatment Plant	Water supply, non-major	Approximately 4 mi northeast of Keowee site	Operational (EPA 2011i)
Cochran Road Wastewater-Treatment Plant	Wastewater-treatment plant, major NPDES, located in Clemson, South Carolina	Approximately 7 mi southeast of Keowee site	Operational (EPA 2011j)
12 Mile RV and Wolf Creek Waste Water Treatment Plant	Wastewater-treatment plant, major NPDES	Approximately 10 mi northeast of Keowee site	Operational (EPA 2011k)
Pickens County Middle Regional Waste Water Treatment Plant	Wastewater-treatment plant, major NPDES	Approximately 10 mi southeast of Keowee	Operational (EPA 2011l)
City of Pickens Water Treatment Plant	$15.9 million funded to construct a water-treatment plant	12.5 mi from Keowee site	In progress (ARRA 2011)
Big Creek East Waste Water Treatment Plant	Improvements to take effluents out of Saluda River	Approximately 26 mi east-southeast of the Keowee site	Operational. Proposed improvements funded (ARRA 2011).
Minor water dischargers and wastewater-treatment plants	NPDES-permitted municipal and industrial discharges.	Throughout the 50-mi region	Operational

Table 9-10. (contd)

Project Name	Summary of Project	Location	Status
Other Projects/Activities			
Surface mines including the Crowder Construction Six Mile Pit, Oconee County Quarry, the Commerce Pit, and the Greentree Pit	Surface mining operations for construction materials	Various locations within the region	Operational (EPA 2010ao)
Various hospitals	Medical isotopes	Within the 50-mi region	Operational in Oconee and Pickens Counties
Commercial dairies and poultry farms including Cobb-Vantress and Columbia	Commercial production of animal products	In Georgia, North Carolina, and South Carolina throughout the 50-mi region	Operational (South Carolina Dairy Association 2010)
Future Urbanization	Construction of housing units and associated commercial buildings; roads, bridges, and railroad; construction of water- and/or wastewater-treatment and distribution facilities and associated pipelines, as described in local land-use planning documents.	Throughout region.	Construction would occur in the future, as described in State and local land-use planning documents
ARRA Capitalization Grant for City of Clemson	$288,000 funded for wastewater-treatment facilities and green infrastructure that will preserve and create jobs and promote economic recovery	Within 10 mi of the Keowee site	In progress (ARRA 2011)

Table 9-10. (contd)

Project Name	Summary of Project	Location	Status
Oconee County School District Grants	$16.6 million funded to support public elementary, secondary, and post-secondary education as well as early childhood education, education for children with disabilities (including ages 3–5), improving teaching and learning for students most at risk of failing	Within 10 mi of the Keowee site	In progress (ARRA 2011)
Pioneer Rural Water District ARRA Grant	$1.6 million funded for the construction of drinking-water facilities, green infrastructure, program administration, and drinking-water-related activities	14.2 mi from Keowee site	In progress (ARRA 2011)
Town of Pendleton Capitalization Grants	$3.6 million funded for constructing wastewater-treatment facilities, green infrastructure, nonpoint source projects, estuary projects and program administration to promote economic recovery	10.7 mi from Keowee site	In progress (ARRA 2011)
Southside Rural Community Water District Safe Drinking Water Grant	$1.4 million funded for the construction of drinking-water facilities, green infrastructure, program administration, and drinking-water-related activities	11.1 mi from Keowee site	In progress (ARRA 2011)

Table 9-10. (contd)

Project Name	Summary of Project	Location	Status
Pickens County School District Grants	$11.6 million funded to improve education to children with disabilities, students at risk of failing, improve education for homeless/ less fortunate students, and for improving EE	13.5 mi from Keowee site	In progress (ARRA 2011)
Pickens City Community Block Grant	$3.4 million funded to modernize infrastructure and public facilities that provide basic services to residents and promote EE and conservation as well as provide jobs to the people	12 mi from Keowee site	In progress (ARRA 2011)

The Keowee site is a wooded greenfield site located approximately 1 mi south of the Oconee Nuclear Station. The Keowee site is wholly owned by Duke, and is maintained as forested land. Figure 9-5 shows the Keowee site region.

The Keowee site is located in the northwest portion of Duke's service territory. The western edge of the Keowee site is bound by US-130, on the north by US-183, and on the east by the Keowee River. The area is predominantly rural; however, sparse populations, including some residential developments, exist west of the site between US-130 and Lake Keowee. The nearest population centers are Seneca and Clemson, South Carolina, which are both approximately 7 mi south of the site; Anderson, South Carolina, which is approximately 21 mi southeast of the site; and Greenville, South Carolina, which is approximately 27 mi east of the site.

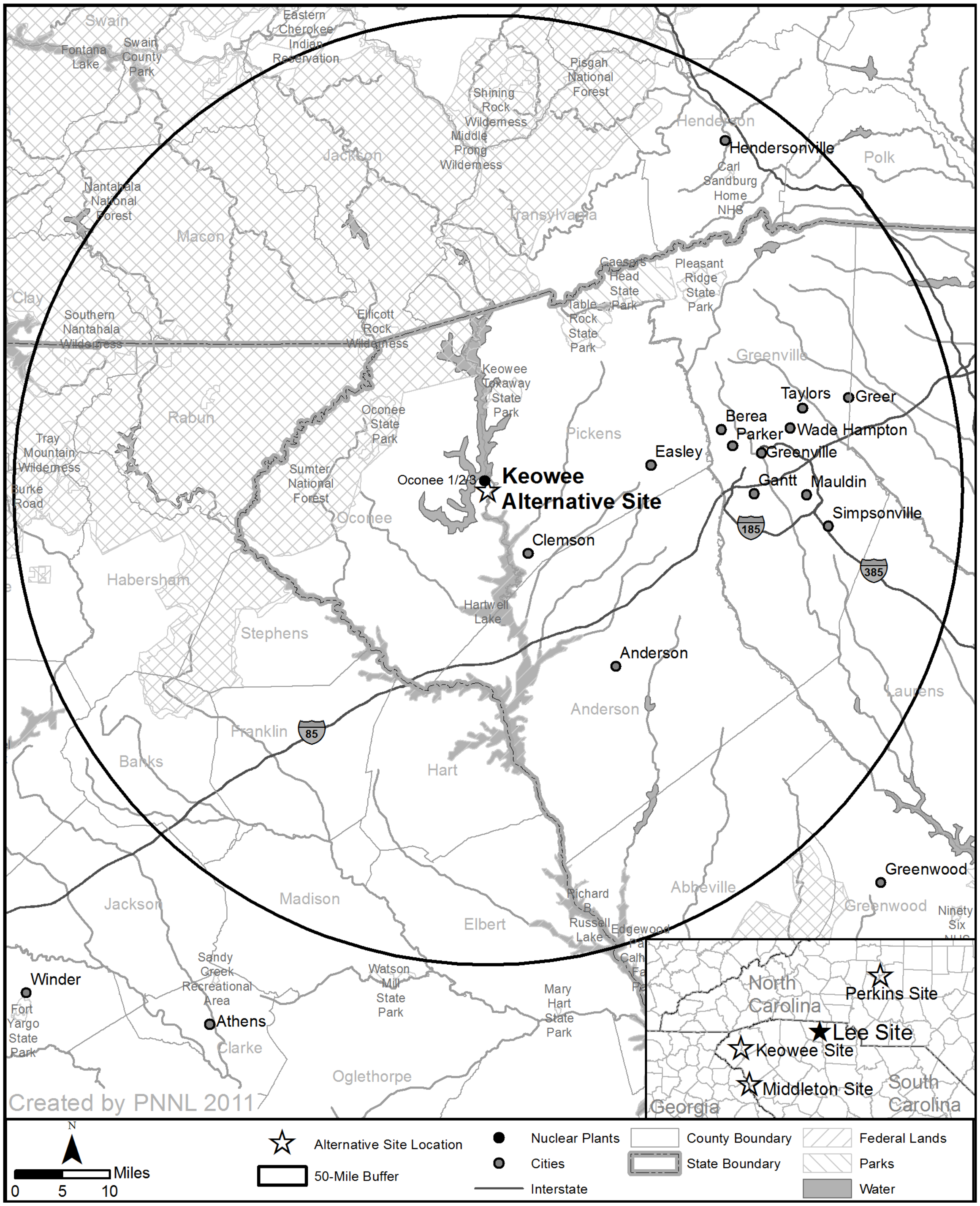

Figure 9-5. The Keowee Site Region

9.3.4.1 Land Use

The following analysis addresses impacts on land use from building and operating two new nuclear generating units at the Keowee site in Oconee County, South Carolina. In addition to land-use impacts from building and operations, the cumulative analysis for the Keowee site considers other past, present, and reasonably foreseeable future actions that could contribute to the cumulative land-use impacts, including other Federal and non-Federal projects and the projects listed in Table 9-10.

Site Description

The Keowee site in Oconee County is located near the northwest border of South Carolina, adjacent to the Oconee Nuclear Station. The site is not in the coastal zone. The Keowee site is a greenfield site currently managed as forested land. The site would require extensive grading and the development of an offsite supplemental water reservoir (Duke 2009b). Building a nuclear facility on the Keowee site would require the relocation of an existing road that runs next to the site, also a new access road to the site would be built (Duke 2009c). The surrounding vicinity of the site has a low level of development but the location near the water intake structure has a high level of residential development (Duke 2009c).

Building and Operation Impacts

The Keowee site would require significant grading and cut-fill activities to support a two-unit nuclear power facility (Duke 2009c). Based on information provided by the applicant and the review team's independent assessment, development of the proposed new units would require about 450 ac onsite (Duke 2009c) and 1300 ac offsite for a supplemental water reservoir (Duke 2009b). An 8.8-mi railroad spur to support construction deliveries and approximately 4 mi of cooling-water pipeline would be built as well (Duke 2010g). Table 9-11 summarizes expected land-use impact parameters for the Keowee site, the supplemental water reservoir, and ancillary facilities.

Table 9-11. Land-Use Impact Parameters for the Keowee Site

Parameter	Value	Source
Required project area	450 ac	Duke (2009c)
Number of supplemental water reservoirs	1	Duke (2009c)
Supplemental water reservoirs, area required	1300 ac	Duke (2009c)
Ancillary facilities	130 ac	Duke (2010g)
Number of new transmission-line routes	1	Duke (2010g)
Total transmission-line corridor distance (270-ft-wide corridor)	1.3 mi	Duke (2010g)
Railroad spur distance (100-ft-wide corridor)	8.8 mi	Duke (2010g)
Cooling-water pipeline (50-ft-wide corridor)	4.0 mi	Duke (2010g)

Due to the proximity of the Oconee switchyard, only a short distance (1.3 mi) of transmission lines would be needed (Duke 2010g). Land currently used for forests or timber production would be altered, replaced with grasses and other types of ground cover (Duke 2009c).

Cumulative Impacts

For the analysis of land-use impacts at the Keowee site, the geographic area of interest is considered to be the 50-mi region centered on the Keowee site, which includes all transmission-line corridors. Land-use planning for transmission-line routing over wide areas must consider land-use plans of adjoining counties and other land-managing agencies, rather than considering one county in isolation. Furthermore, in predominantly rural settings such as that surrounding the Keowee site, land-use changes occurring substantial distances away from a project site can substantially influence land-use planning decisions close to the site. Roads and other public facilities and services in rural areas tend to serve people who are spread thinly but broadly over large portions of the landscape. Therefore, land-use changes can affect roads and other facilities at greater distances than similar changes in more densely populated areas.

Several State, U.S., and interstate highways currently traverse the area. The proposed project would indirectly result in land conversions to residential areas, roads, and businesses to accommodate growth, new workers, and services related to the proposed nuclear facility. Other reasonably foreseeable projects in the area that could contribute to an increase in urbanization include potential development of new residences within easy commuting distance of the new plant and the development and upgrading of local roads and highways. Because the other projects described in Table 9-10 do not include any reasonably foreseeable changes in land-use types within 50 mi of the Keowee site, other than general growth and urbanization development, there would not be any significant additional cumulative impacts on land use from those activities.

As described above, building the proposed facilities, development of new transmission-line corridors, inundation to create a supplemental reservoir, and building the water intake and railroad spur to support the new units may affect approximately 1880 ac of land. The overall land-use impacts of these activities would be noticeable and permanent, particularly in the area containing the supplemental pond. If additional transmission lines are built from other energy projects, there would be a cumulative land-use impact from the additional amount of land converted to utility corridor use for transmission lines. Because transmission lines are often co-located and are relatively narrow, the review team expects that the cumulative impact would be consistent with the land-use plans and zoning regulations of the affected counties. Nonetheless, consistent with previous discussions, new transmission-line corridors could noticeably alter the land-use classification acreage proportions, within the geographic area of interest.

Due to the potential reclassification of acreage within the region caused by the transmission-line development and the supplemental pond, the review team concludes that the cumulative land-use impacts associated with the proposed project at the Keowee site, and other projects in the geographic area of interest would be MODERATE. Considering the land needs noted above, building and operating two new nuclear units at the Keowee site would be a significant contributor to these impacts.

9.3.4.2 Water Use and Quality

This section describes the review team's assessment of impacts on water use and quality associated with building and operating two new nuclear units at the Keowee site. The assessment considers other past, present, and reasonably foreseeable future actions that affect water use and quality, including the other Federal and non-Federal projects listed in Table 9-10. The Keowee site hydrology, water use, and water quality are discussed in the ER (Duke 2009c) and in the response to a RAI (Duke 2010l).

The geographic area of interest for the Keowee site is the drainage basin of the Keowee and Little Rivers upstream of the site and the Seneca and Savannah Rivers downstream of the site because these are the resources that would be affected if the proposed project were located at the Keowee site. For groundwater, the geographic area of interest is limited to the site because Duke has indicated no plans for use of groundwater to build and operate the plant (Duke 2009c).

The cooling- and service-water supply for a two-unit nuclear generating station located at the Keowee site would be Lake Keowee. Lake Keowee has a full pond elevation of 800 ft mean sea level (msl) and cannot be drawn down below 794.6 ft without negatively affecting the operation of Oconee Nuclear Station. The Keowee River is not listed as impaired by South Carolina for any water-quality parameters although the Savannah River downstream of the site is listed as impaired for mercury, fecal coliform, and turbidity (EPA 2010am).

Building Impacts

Because the building activities at the Keowee site would be similar to those at the Lee Nuclear Station site, the review team estimated that the water needed for building activities at the Keowee site would be identical to the proposed amount of water use for building at the Lee Nuclear Station site. Consistent with the Lee Nuclear Station, the review team assumed that groundwater would not be used. During building activities at the Lee Nuclear Station site, the average estimated water use is projected to be 250,000 gpd or 0.39 cfs (Table 3-5). This water-use rate is inconsequential when compared to the volume of Lake Keowee. The review team assumed that building activities could cease, if needed, during very low lake level conditions without any significant overall impact on the schedule. Because the surface-water withdrawal would be minor compared to the volume of the lake and because the withdrawal from the lake would be temporary and limited to the building period, the review team concludes that the impact of surface-water use for building the two new nuclear units at the Keowee site would be minimal.

Duke stated that it would need to build a reservoir at the Keowee site to provide sufficient water for continual operation of the two units based on an analysis using the worst-case drought of record. This analysis indicated that water from another source would be needed for new nuclear units for a period of 169 days should a similar drought occur in the future (Duke 2010l). Development of this site for two nuclear units would require the building of a water reservoir with a storage capacity of 80,000 ac-ft on the Keowee site supplied with water from Lake Keowee that could supply water for plant operations during droughts. Duke would dam the drainage of one tributary creek to the Keowee River to create the storage volume needed to supply the supplemental condenser cooling water during future droughts of the magnitude experienced during the historic worst-case drought (Duke 2010l). Because a single creek would be affected and the drainage area is small relative to the area of the Keowee-Savannah River Basin, changes to flow in the Keowee-Savannah River system as a result of building the reservoir would not be detectable.

As stated above, the review team assumed that no groundwater would be used to build the units at the Keowee site. The review team also assumed that the impact of dewatering the excavations needed for building two units at the site would be temporary and minor at the Keowee site because technology (such as slurry walls, grouting) is readily available to control water inflow to the excavation if needed. Therefore, because there would be no groundwater use and the impact of dewatering would be temporary and minor, the review team determined that there would be minimal impact on groundwater resources.

Surface-water quality could be affected by stormwater runoff during site preparation and the building of the facilities. The SCDHEC would require Duke to develop a SWPPP. The SWPPP would identify BMPs to control the impacts of stormwater runoff. The review team anticipates that Duke would construct new detention and infiltration ponds and drainage ditches to control delivery of sediment from the disturbed area to nearby waterbodies. Sediment carried with stormwater from the disturbed area would settle in the detention ponds and the stormwater would infiltrate into the shallow aquifer. As a result, stormwater runoff is not anticipated to affect water quality in Lake Keowee. Therefore, during building activities, the surface water-quality impacts near the Keowee site would be temporary and minimal.

While building new nuclear units at the Keowee site, impacts on groundwater quality may occur from leaching of spilled effluents into the subsurface. The review team assumes that the BMPs Duke has proposed for the Lee Nuclear Station site would also be in place during building activities at the Keowee site, and therefore the review team concludes that any spills would be quickly detected and remediated. As discussed in Section 4.2.3.1, the development of an SWPPP with its call for implementation of BMPs would minimize water-quality impacts.

Because any spills related to building activities would be quickly remediated under BMPs, and the activities would be temporary, the review team concludes that the groundwater-quality impacts from building at the Keowee site would be minimal.

Operational Impacts

The review team assumed that the cooling-water system for the proposed plant, if built and operated at the Keowee site, would be similar to that proposed at the Lee Nuclear Station site; specifically, the cooling-water system would use cooling towers and blowdown would be discharged to the Lake Keowee.

Duke proposes that cooling water be withdrawn from Lake Keowee. A cooling-water reservoir with a storage capacity of 80,000 ac-ft at the Keowee site supplied with water from Lake Keowee would provide supplemental water when adequate water from the lake may not be available (Duke 2010l). Duke did not provide details of the cooling-water intake and effluent discharge locations. However, it is standard practice for power plants to design cooling-water intake and effluent discharge locations such that recirculation of discharged effluent to the intake does not occur.

Duke determined that the total amount of water withdrawn from the water source to operate two units would be approximately 35,000 gpm (78 cfs). Approximately 2000 gpm (4.5 cfs) would be used for the screen wash system and thus return to the river at the intake location. As indicated for the Lee Nuclear Station in Chapter 3, consumptive losses through evaporation and drift from cooling two units would be approximately 24,700 gpm (55 cfs) (Duke 2009c). The remaining 18 cfs would be returned via pipeline to the lake at the discharge location.

The source of water for this site would be from Lake Keowee, which would support the 55 cfs consumptive withdrawal for the new units. An 80,000 ac-ft supplemental water reservoir would need to be built to supply water during low water availability periods in Lake Keowee so operation of Oconee Nuclear Station, also located on Lake Keowee, would not be affected and the minimum release flows from Lake Keowee could be maintained.

When water level in Lake Keowee drops below 794.6 ft msl, water from a supplemental water-storage reservoir would be required or operation of the plant would need to be curtailed. The proposed 80,000 ac-ft reservoir would allow the plant to operate for approximately 169 days (Duke 2010l). Based on the small fraction of available water that would be used during normal flow conditions and the availability of the proposed water-storage reservoir for use during low-flow periods, the review team determined that the operational impact of the proposed plant at the Keowee alternative site on surface water would be minimal. Similar to the Lee Nuclear Station, the reservoir refill rate was assumed to be 200 cfs. This would be limited based on current lake conditions and would only be used after the reservoir had been drawn down to provide water for plant operation during drought periods.

As stated above, the review team assumed that no groundwater would be used to operate the units at the Keowee site. Therefore, because there would be no groundwater use, the review team determined that there would be no impact on groundwater resources.

During the operation of the proposed plant at the Keowee site, impacts on surface-water quality could result from stormwater runoff, discharges of treated sanitary and other wastewater, and blowdown from cooling towers into the Lake Keowee. The review team assumed that the blowdown rate would be the same as that at the Lee Nuclear Station site, 8216 gpm (18 cfs). Blowdown would be regulated by SCDHEC pursuant to 40 CFR Part 423 and all discharges would be required to comply with limits established by the SCDHEC in an NPDES permit.

The SCDHEC would require Duke to develop a SWPPP. The plan would identify measures to be used to control stormwater runoff. Because stormwater controls would be in place and blowdown discharges would be regulated under an NPDES permit, the review team concludes that the impacts on surface-water quality from operation of two nuclear units at the Keowee site would be minimal.

During the operation of new nuclear units at the Keowee site, impacts on groundwater quality could result from potential spills. Spills that might affect the quality of groundwater would be prevented or remediated by using BMPs. Because BMPs would be used to quickly remediate spills and no intentional discharge to groundwater should occur, the review team concludes that the impacts on groundwater quality from operation of two nuclear units at the Keowee site would be minimal.

Cumulative Impacts

In addition to water-use and water-quality impacts from building and operations activities, cumulative impacts analysis considers other past, present, and reasonably foreseeable future actions the affect the same environmental resources. For the cumulative analysis of impacts on surface water, the geographic area of interest for the Keowee site is the drainage basin of the Keowee and Little Rivers upstream of the site and the Seneca and Savannah Rivers downstream of the site because these are the resources that would be affected if the proposed project were located at the Keowee site. For groundwater, the geographic area of interest is limited to the alternative site because Duke has indicated no plans for use of groundwater to build and operate the plant (Duke 2009c).

Key actions that have past, present, and future potential impacts on surface-water supply and surface-water quality in this drainage basin include the operation of the dams that form Lake Keowee and other dams and reservoirs downstream of the Keowee site. Lake Keowee is created by dams on the Keowee River (Keowee Dam) and on the Little River (Little River Dam). Upstream of Lake Keowee is the Jocassee Hydro Station, a 610-MW pumped-storage facility that creates Lake Jocassee. Downstream of the site are Hartwell Dam, Russell Dam and Thurmond Dam. These dams serve to increase the reliability of water supply to the region and to provide power.

The Oconee Nuclear Station, which includes three 846-MW units and is located adjacent to the Keowee site, has past, present, and future impacts on water quality and water supply in the region because it uses Lake Keowee as a source of cooling water. Additional actions that have past, present, and future potential impacts on water supply and water quality in the Savannah River Basin include operating South Carolina Electric and Gas' (SCE&G's) Urquhart Station (a fossil-fueled electrical generating plant) (SCE&G 2009a), operating and decommissioning DOE facilities at the Savannah River Site (SRS), operating two existing nuclear power plants at the Vogtle site, building and operating two new power plants at the Vogtle site, and other municipal and industrial activities in the Savannah River Basin.

The GCRP has compiled the state of knowledge in climate change (GCRP 2009). This compilation has been considered in the preparation of this EIS. The projections for changes in temperature, precipitation, droughts, and increasing reliance on aquifers within the Keowee River Basin are similar to those at other alternative sites in the region. These regional changes are discussed in Section 7.2 of this EIS.

Cumulative Water Use

Based on a review of the GCRP assessment of the Southeast United States region, the review team conservatively estimated a decrease in streamflow of 10 percent over the life of the station. This reduction in streamflow would result in a higher incidence of times when the Keowee reservoir water level drops below 794.6 ft msl. As discussed above, when the water level in Lake Keowee drops below 794.6 ft msl, water from a supplemental water-storage reservoir would be required or operation of the plant would need to be curtailed. The review team also considered the increased water demands associated with an increased population in the region. The South Carolina Department Natural Resources (SCDNR) indicated that "water demand for industry, public supply, crop and golf course irrigation, and domestic use is expected to increase by nearly 50 percent between the years 2000 and 2045" (SCDNR 2004).

By considering the impact of climate change on historical flows and allowing for continued increase in water demand due to population growth in the region, the review team determined that the reservoir would be needed more frequently as time goes on and, in some instances, the plant would exhaust its water supply and the units might be required to derate or cease operation.

The impacts of the other projects listed in Table 9-10 are considered in the analysis included above or would have little or no impact on surface-water use. The projects believed to have little impact are excluded from the analysis either because they are too distant from the Keowee site, use relatively little or no surface water, or have little or no discharge to surface water. Some projects (e.g., park and forest management) are ongoing, and changes in their operations that would have large impacts on surface-water use appear unlikely.

The review team determined that the cumulative impacts on water supply associated with operation of the proposed units, other water users, climate change, and population growth would be MODERATE, but the incremental impact associated with water use for the Keowee site was determined not to be a significant contributor to this MODERATE impact.

As stated above, the review team assumed that no groundwater would be used to build or operate the units at the Keowee site and that groundwater impacts from dewatering would be temporary and minor. Therefore, the review team determined that the Keowee site by itself would have minimal impact on groundwater resources.

Other projects listed in Table 9-10 are either currently in operation (for example the Oconee Nuclear Station, Units 1, 2, and 3) or are 10 or more miles away from the Keowee site. Therefore, the impact of operation of these projects is included in the current hydrology analysis or will not contribute to a cumulative impact on groundwater supply within the ROI. Because groundwater-use impacts are limited and temporary due to aquifer dewatering during the building phase, and other projects are not anticipated near the Keowee site, the review team concludes that cumulative impacts on groundwater use at the alternative site would be SMALL.

Cumulative Water Quality

Point and nonpoint sources have affected the water quality of the Keowee and Little Rivers upstream of the Keowee site and the Seneca-Savannah River system downstream of the site. As mentioned above, the Savannah River downstream of the alternative site location is listed as impaired for use due to mercury, fecal coliform, and turbidity (EPA 2010am). The impacts of other projects listed in Table 9-10 are either considered in the analysis included above or would have little or no impact on surface-water quality. Therefore, the review team concludes that the cumulative impact on surface-water quality of the receiving waterbody would be MODERATE. Water-quality information presented above for the impacts of building and operating the proposed new units at the Keowee site would also apply to evaluation of cumulative impacts. As mentioned above, the State of South Carolina requires an applicant to develop an SWPPP. The plan would identify measures to be used to control stormwater runoff. The blowdown would be regulated by EPA pursuant to 40 CFR Part 423 and all discharges would be required to comply with limits established by the SCDHEC in a NPDES permit. Such permits are designed to protect water quality. Therefore, because industrial and wastewater discharges from the proposed units would comply with NPDES permit limitations and any stormwater runoff from the site during operations would comply with the SWPPP, the review team concludes that building and operating the proposed units at the Keowee site would not be a significant contributor to cumulative impacts on surface-water quality.

With the exception of the Oconee Nuclear Station and the Keowee Hydroelectric Station, other projects listed in Table 9-10 are 10 or more miles away from the Keowee site and thus will not contribute to a cumulative impact on groundwater quality near the site. The Oconee Nuclear

Station has reported elevated tritium concentrations in groundwater onsite (NRC 2010f) although groundwater offsite has not been affected. Operation of the Keowee Hydroelectric Station is not anticipated to have a noticeable effect on groundwater quality. The review team also concludes that with the implementation of BMPs, the impacts on groundwater quality from building and operating two new nuclear units at the Keowee site would likely be minimal. Therefore, the cumulative impact on groundwater quality would be SMALL.

9.3.4.3 Terrestrial and Wetland Resources

The following analysis includes impacts from building and operating the proposed new facilities on terrestrial ecology resources at the Keowee site. The analysis also considers past, present, and reasonably foreseeable future actions that affect the terrestrial ecological resources, including other Federal and non-Federal projects and the projects listed in Table 9-10. For the analysis of terrestrial ecological impacts at the Keowee site, the geographic area of interest includes the portions of Anderson, Oconee, and Pickens Counties that are within a 15-mi radius of the Keowee site. This area encompasses the supplemental water reservoir and all the ancillary facilities (one transmission line, a cooling-water pipeline, and a railroad spur), and the important animal and plant species and communities that could be potentially affected. The 15-mi distance was used by the SCDNR for their species and habitat of concern occurrence analysis.

In developing this EIS, the review team relied on reconnaissance-level information to perform the alternative site evaluation in accordance with ESRP 9.3 (NRC 2000a). Reconnaissance-level information is data that are readily available from agencies and other public sources such as scientific literature, books, and Internet websites. It also can include information obtained through site visits. To identify terrestrial resources at the Keowee site, the review team relied primarily on the following information:

- Oconee Nuclear Station Final Environmental Report (Duke Energy 1998) and Environmental Impact Statement for license renewal (NRC 1999b)
- Lee Nuclear Station COL ER and supplement (Duke 2009b, c)
- Lee Nuclear Station Joint Application for Activities Affecting Waters of the United States submitted by Duke (2011h) to the USACE
- a tour of the Keowee alternative site in April 2008 (NRC 2008d) and a tour of the Keowee alternative site and supplemental cooling-water reservoir site in August 2010 (NRC 2010c)
- responses to RAIs provided by Duke (2010g)
- FWS Endangered Species Program database for South Carolina (FWS 2012a) and South Carolina Natural Heritage Program (SCDNR 2012j, 2012n, 2012o) county record information
- correspondence regarding species and habitat occurrences from the SCDNR (SCDNR 2012b).

Site Description

The Keowee site is situated within the Piedmont ecoregion in South Carolina (Griffith et al. 2002). As described in Section 7.3.1, the Piedmont ecoregion has been altered to a great extent since European settlement, primarily because of farming, agriculture, and silviculture. Existing forests in the area are second growth, and are now dominated by loblolly (*Pinus taeda*), shortleaf (*P. echinata*), and Virginia (*P. virginiana*) pines mixed with red and white oak (*Quercus rubra*, *Q. alba*), hickory (*Carya* sp.), and tulip poplar (*Liriodendron tulipifera*) (Duke Energy 1998).

Duke provided a description of the vegetation cover types within a 2500-ft radius of the center of the Keowee site. The cover types are mixed hardwood (212 ac), pine (122 ac), mixed hardwood/pine (46 ac), pine/mixed hardwood (39 ac), open water (18 ac), and open/field/meadow (13 ac). Wetland and upland scrub cover types do not occur within this area (Duke 2009b). Hardwood and mixed hardwood forest, which provide higher-quality habitat to wildlife than pine or open/field/meadow, comprise 258 ac or about 57 percent of the Keowee site. A partial field survey of the Keowee site, conducted in 1998 as part of the Oconee Nuclear Station license renewal environmental review (Duke Energy 1998), identified several areas that retained characteristics of mature upland forest that Duke designated as protected natural areas. As described in Section 9.3.4.1, operation of new facilities at the Keowee site would require one offsite supplemental cooling-water reservoir, and ancillary facilities consisting of a railroad spur, a transmission line, and a cooling-water pipeline.

The staff visited the Keowee site in April 2008 (NRC 2008d) and the Keowee site and the site of the supplemental cooling-water reservoir and surrounding area in August 2010 (NRC 2010c). The Clemson University Experimental Forest and associated stream system, located in Pickens County, South Carolina, is representative of much of the habitat that surrounds the stream system at the site of the cooling reservoir. This forest consists largely of abandoned cotton farms that have returned to second growth hardwood or mixed hardwood/pine forest (Clemson University 2009). The Clemson University Experimental Forest supports a mature bottomland forest, an expansive floodplain, extensive alluvial wetlands, and diverse and abundant amphibian, reptile, and bird populations (Clemson University 2008).

Federally Listed and State-Ranked Species

Duke provided no new field survey information for the Keowee site beyond its partial characterization in 1998 for the Oconee Nuclear Station license renewal ER (Duke Energy 1998). The review team is unaware of any field surveys of the site of the cooling-water reservoir, the transmission-line corridor, water-pipeline corridor, or railroad corridor.

The presence/absence of Federally listed and State-ranked species in the project footprint cannot be ascertained without field surveys. However, a query of the South Carolina rare, threatened, and endangered species inventory database (SCDNR 2012b) indicates the presence of approximately 120 plant and animal species and communities within 15 mi of the Keowee site that are either Federally listed as threatened or endangered, candidates for listing, and/or are ranked by the State of South Carolina as critically imperiled, imperiled, or vulnerable. The State ranking (in addition to the Federal listing) provides the only common basis for comparing numbers of important animal and plant species among the Lee, Perkins, Keowee, and Middleton Shoals sites. Peregrine falcons (*Falco peregrinus anatum*) have been introduced in the area of Jocassee Dam north of the Keowee site, but are not known to reside near the Oconee or Keowee sites (NRC 1999b). This species is not State-ranked, but has been assigned a State protection status as threatened (Table 9-12).

The vast majority of the approximately 120 species identified in the database queries are highly unlikely to occur at either the Keowee site or the site of the supplemental cooling-water reservoir because of habitat affinities that are significantly different from habitat conditions at these locations. The northern portions of Oconee and Pickens Counties, beginning about 10 mi north of the Keowee site, lay within the Blue Ridge ecoregion, which differs significantly from the Piedmont ecoregion in geology, elevation, and precipitation (Griffith et al. 2002; SCDNR 2005). For example, the Blue Ridge ecoregion constitutes about 1.7 percent of the total land area of South Carolina (SCDNR 2005), but it harbors 40 percent of the State's rare plant species (TNC 2011). The query of the SCDNR database identified approximately 100 plant species within 15 mi of the Keowee site in Anderson, Oconee, and Pickens Counties that are ranked as critically imperiled, imperiled, or vulnerable (SCDNR 2012b). In contrast, Anderson County lies entirely within the Piedmont ecoregion and has less than 10 such plant species (SCDNR 2012n). Because the majority of the species are highly unlikely to occur on either the Keowee site or the site of the supplemental cooling-water reservoir, they should not serve as a basis to compare potential impacts among the alternative sites. Consequently, the list of State-ranked plant species was screened using habitat and county distribution information provided by Weakley (2010) and NatureServe Explorer (2010); this resulted in the identification of 57 plant taxa potentially occurring near the site. The list of State-ranked animal species was similarly screened using habitat and county distribution information provided by Burt and Grossenheider (1980), Opler et al. (2011), Kaufman (2000), Menzel et al. (2003), NatureServe Explorer (2010), Savannah River Ecology Laboratory Herpetology Program (2011), and SCDNR (2005), resulting in the identification of seven species potentially occurring near the site. The resulting State-ranked animal and plant species that could potentially occur at the Keowee site or the site of the proposed cooling-water reservoir are listed in Table 9-12.

Table 9-12. Terrestrial Federally Listed and Candidate Species, and State-Ranked Species and Communities within 15 mi of the Keowee site in Oconee, Pickens, and Anderson Counties, South Carolina[(a)]

Scientific Name	Common Name	Federal Status[(b)]	SC State Rank/ Protection Status[(c)]	Counties of Occurrence	Habitat[(d)]
Mammals					
Neotoma floridana	eastern woodrat	-	S3	Oconee, Pickens	wooded areas, ravines, floodplain forest
Sylvilagus aquaticus	swamp rabbit	-	S2	Oconee, Pickens	mature forests in floodplains, bottomlands, riparian areas
Birds					
Accipiter cooperii	Cooper's hawk	-	S3	Oconee, Pickens	primarily mature forest, also open woodland and forest edge
Falco peregrinus anatum	American peregrine falcon	-	SNR/ST	Pickens	nests on cliffs and on tall buildings in cities[(e)]
Reptiles					
Pituophis melanoleucus	pine snake	-	S3	Pickens	xeric, pine-dominated or pine-oak woodland with an open, low understory on sandy soils
Invertebrates					
Autochton cellus	golden-banded skipper	-	S2 S4	Oconee	near streams in rich forests
Speyeria diana	Diana fritillary	-	S3?	Oconee	mixed forests with violets in the understory
Plants					
Agrimonia pubescens	soft groovebur	-	S1	Pickens	dry to moist forests and woodlands
Allium cernuum	nodding onion	-	S2	Oconee, Pickens	open woodlands or around outcrops
Aristolochia tomentosa	woolly Dutchman's-pipe	-	S1	Pickens	floodplain forests, disturbed areas
Arnoglossum muehlenbergii	great Indian plantain	-	S1	Pickens	cove forests, other mesic forests

Table 9-12. (contd)

Scientific Name	Common Name	Federal Status[b]	SC State Rank/ Protection Status[c]	Counties of Occurrence	Habitat[d]
Asplenium pinnatifidum	lobed spleenwort	-	S1	Pickens	moist to dry rock outcrops
Carex gracillima	graceful sedge	-	S2	Oconee, Pickens	moist ravine and slope forests, floodplains of rivers and large creeks
Carex prasina	drooping sedge	-	S2	Oconee, Pickens	rich forests, especially in seepage
Carex scabrata	rough sedge	-	S2	Oconee, Pickens	seepage slopes, brookbanks
Caulophyllum thalictroides	blue cohosh	-	S2	Oconee, Pickens	rich forests
Circaea lutetiana ssp. *canadensis*	Enchanter's nightshade	-	S3	Oconee, Pickens	mesic, nutrient-rich forests
Collinsonia verticillata	whorled horse-balm	-	S3	Anderson, Oconee, Pickens	rich moist (cove) forests to dry oak forests
Cypripedium parviflorum var. *pubescens*	large yellow lady's-slipper	-	S3	Oconee, Pickens	rich, mesic forests
Cystopteris protrusa	lowland brittle fern	-	S2	Oconee, Pickens	rich woods or moss- and soil-covered talus in boulder fields, occasionally on rock outcrops
Draba aprica	open-ground whitlow-grass	-	S1	Pickens	shallow soils around granitic flatrocks
Echinacea laevigata	smooth coneflower	E	S3	Anderson, Oconee, Pickens	open woodlands and glades
Euonymus atropurpureus	eastern wahoo	-	S1	Oconee, Pickens	bottomland forests, riverbanks
Eurybia avita	Alexander's rock aster	-	S1	Pickens	shallow soils on granitic flatrocks
Galearis spectabilis	showy orchis	-	S3	Oconee, Pickens	rich, deciduous forests
Gaylussacia baccata	black huckleberry	-	S1	Oconee, Pickens	xeric, acidic forests and woodlands, rock outcrops
Helenium brevifolium	shortleaf sneezeweed	-	S1	Oconee, Pickens	seepage bogs

Table 9-12. (contd)

Scientific Name	Common Name	Federal Status[b]	SC State Rank/ Protection Status[c]	Counties of Occurrence	Habitat[d]
Helianthus glaucophyllus	white-leaved sunflower	-	S2	Oconee, Pickens	moist forests, woodlands, and woodland edges
Helianthus porteri	Porter's goldeneye	-	S1	Pickens	shallow soils over granite on low-elevation granite domes or flatrocks
Hydrocotyle americana	American water-pennywort	-	S1	Oconee, Pickens	bogs, marshes, seepages
Isoetes melanospora	black-spored quillwort	E	S1	Pickens	pools on granite flatrocks
Isoetes piedmontana	Piedmont quillwort	-	S2	Pickens	seepage on granitic flatrocks
Juglans cinerea	butternut	-	S3	Oconee, Pickens	moist, nutrient-rich forests
Juncus georgianus	Georgia rush	-	S2	Pickens	shallow depressions in granitic outcrops
Liparis liliifolia	large twayblade	-	S1	Oconee, Pickens	moist forests, floodplains
Lonicera flava	yellow honeysuckle	-	S2	Oconee, Pickens	in soil mats around granitic domes
Lygodium palmatum	climbing fern	-	S3	Oconee, Pickens	bogs, moist thickets, swamp forests, sandstone outcrops, roadside ditches and roadbanks
Lysimachia fraseri	Fraser's loosestrife	-	S3	Anderson, Oconee, Pickens	hardwood forests, forest edges and roadbanks, thin soils around rock outcrops
Menispermum canadense	Canada moonseed	-	S2	Pickens	moist nutrient-rich forests, especially on floodplains or lower slopes
Minuartia uniflora	one-flower stitchwort	-	S3	Pickens	granitic flatrocks

Table 9-12. (contd)

Scientific Name	Common Name	Federal Status[b]	SC State Rank/ Protection Status[c]	Counties of Occurrence	Habitat[d]
Monotropsis odorata	sweet pinesap	-	S2	Oconee, Pickens	dry to mesic upland woods under oaks and/or pines
Nestronia umbellula	nestronia	-	S3	Oconee, Pickens	mesic to dry oak forests
Orobanche uniflora	one-flowered broomrape	-	S2	Oconee, Pickens	sandy streambanks and riverbanks, rich forests
Osmorhiza claytonii	hairy sweet-cicely	-	S2	Oconee, Pickens	cove forests, other moist, fertile forests
Pachysandra procumbens	Allegheny-spurge	-	S2	Oconee, Pickens	moist rich woods
Parnassia asarifolia	kidneyleaf grass-of-parnassus	-	S2	Anderson, Oconee	bogs, sphagnous seeps, brook banks
Pellaea atropurpurea	purple-stem cliff-brake	-	S1	Oconee, Pickens	outcrops of limestone and other rocks
Philadelphus hirsutus	streambank mock-orange	-	S2	Oconee, Pickens	bluffs, rock outcrops, rocky woodlands, often with seepage
Platanthera lacera	green-fringe orchis	-	S2	Pickens	swamps, bogs, seepages
Rudbeckia heliopsidis	sun-facing coneflower	-	S1	Oconee	limestone or sandstone streambanks and barrens, pinelands, roadsides
Ruellia caroliniensis ssp. *ciliosa*	sandhills wild petunia	-	S1	Pickens	dry to moist forests and woodlands
Sarracenia rubra ssp. *jonesii*	mountain sweet pitcher-plant	E	S1	Pickens	bogs, cataract seeps
Symphyotrichum georgianum	Georgia aster	C	SNR	Oconee	dry, rocky woodlands, woodland borders, roadbanks, powerline rights-of-way
Solidago bicolor	white goldenrod	-	S2	Oconee, Pickens	woodlands, roadbanks, pastures
Stachys latidens	broad-toothed hedge-	-	S2	Oconee, Pickens	mesic forests in coves and on

Table 9-12. (contd)

Scientific Name	Common Name	Federal Status[b]	SC State Rank/ Protection Status[c]	Counties of Occurrence	Habitat[d]
	nettle				mountain slopes, mountain pastures and forest edges
Tiarella cordifolia var. *cordifolia*	heart-leaved foam flower	-	S2	Oconee, Pickens	moist forests, cove forests, rock outcrops
Thermopsis mollis	soft-haired thermopsis	-	S1	Oconee, Pickens	dry slopes and ridges
Tridens chapmanii	Chapman's redtop	-	S1	Pickens	loamy sands of disturbed longleaf pine woodlands, roadsides
Trillium rugelii	southern nodding trillium	-	S2	Anderson, Oconee, Pickens	rich woodlands and forests over mafic or calcareous rocks
Viola pubescens (= *V. pensylvanica*)var. *leiocarpon*	yellow violet	-	S2	Oconee, Pickens	mesic forests
Viola tripartita var. *glaberrima*	smooth three-parted violet	-	S1	Oconee	rich woods[f]
Viola tripartita var. *tripartita*	three-parted violet	-	S3	Oconee, Pickens	rich woods[f]
Waldsteinia lobata	Piedmont strawberry	-	S3	Oconee	forests, streambanks
Xerophyllum asphodeloides	eastern turkeybeard	-	S2	Oconee, Pickens	dry ridges and slopes
Communities					
basic forest	-	-	S2	Oconee	-
pine – oak heath	-	-	S3	Oconee, Pickens	-

Source: Species and Communities Known to Occur Within 15 Miles of Keowee Site October 31, 2012 (SCDNR 2012b)
(a) The list of species was screened to exclude those likely to occur only in the Blue Ridge Mountains ecoregion.
(b) Federal status: E = endangered, T = threatened, C = candidate (FWS 2012a).
(c) State rank: S1 = critically imperiled, S2 = imperiled, S3 = vulnerable, S4 = apparently secure, ? = uncertain (inexact or uncertain rank used as a qualifier), S#S# = a numeric rank range used to indicate uncertainty about the exact status of the element, SNR = unranked. State protection status: SE = state endangered, ST = state threatened (SCDNR 2012b).
(d) NatureServe Explorer (2010) for animals and Weakley (2010) for plants, unless otherwise indicated.
(e) Kaufman (2000).
(f) Gleason and Cronquist (1991).

Some of the State-ranked animal species also have been assigned a State protection status as threatened or endangered. Federally listed species were not similarly screened and all are listed in Table 9-12. Table 9-12 also lists species habitat affinities.

Of the 64 taxa listed in Table 9-12, three are Federally listed as endangered and one is a candidate for listing as threatened or endangered. The mountain sweet pitcher-plant (*Sarracenia rubra* ssp. *jonesii*) is considered endangered and inhabits bogs and cataract seeps in the mountains and in some areas in the foothills of the Piedmont, but is not known to occur near the Keowee site or the site of the cooling-water reservoir (NRC 1999b). The black-spored quillwort (*Isoetes melanospora*) is considered endangered and occupies shallow, flat-bottomed, temporary pools that form in depressions on granite outcrops that contain at least 2 cm of soil (NatureServe Explorer 2010). The smooth coneflower (*Echinacea laevigata*) is considered endangered and formerly inhabited prairie-like or post oak–blackjack oak (*Quercus stellata* – *Q. marilandica*) savannas maintained by fire, but now is known from open woods, cedar barrens, roadsides, dry limestone bluffs, utility corridors, and other open habitats (FWS 1995). The smooth coneflower has been reported to occur approximately 5 to 6 mi northeast of the Keowee site (NRC 1999b). Georgia aster, a Federal candidate species, also is a relict species of the post oak savannah-prairie communities, and now occupies a variety of dry habitats adjacent to roads; along woodland borders; in dry, rocky woods; and within utility corridors (Duke 2009c; FWS 2010a). None of these plant species is known to occur within or near the Keowee site or the site of the cooling-water reservoir.

Plant and animal surveys of the land within a 1-mi radius of the center of the Oconee site were conducted in 1998. This area included about half of the Keowee site and none of the site of the supplemental cooling-water reservoir. Surveys identified no important animal or plant species within the Keowee portion of the survey area (Duke Energy 1998). One State-ranked plant species has been documented within the footprint of the cooling-water reservoir: nestronia (*Nestronia umbellula*) (Table 9-12). Two State-ranked plant species were documented in the vicinity of the railroad spur: soft groovebur (*Agrimonia pubescens*) and nodding onion (*Allium cernuum*) (Table 9-12). Four State-ranked plant species have been documented in the vicinity of Lake Keowee: nestronia, three-parted violet (*Viola tripartita* var. *tripartita*), drooping sedge (*Carex prasina*), and Allegheny-spurge (*Pachysandra procumbens*) (Table 9-12) (Duke 2010g). These species could potentially occur within the footprint of the Keowee site or the site of the cooling-water reservoir.

Nestronia is a shrub that inhabits moist to dry woods in the Piedmont ecoregion. It is parasitic on the roots of both pine and deciduous trees (Gleason and Cronquist 1991) and is considered vulnerable in South Carolina (NatureServe Explorer 2010; SCDNR 2012b). Soft groovebur inhabits dry to moist forests and woodlands (Weakley 2010) and is considered critically imperiled in South Carolina (NatureServe Explorer 2010; SCDNR 2012b). Nodding onion occurs in open woodlands or around rock outcrops (Weakley 2010) and is considered imperiled in South Carolina (NatureServe Explorer 2010; SCDNR 2012b). Three-parted violet inhabits rich woods (Gleason and Cronquist 1991; Weakley 2010) and lacks sufficient documentation in South Carolina (NatureServe Explorer 2010; SCDNR 2012b). There are two varieties in the State: the smooth three-parted violet (*V. tripartita* var. *glaberrima*), which is considered critically imperiled; and the three-parted violet, which is considered vulnerable (Table 9-12) (SCDNR 2012b). Drooping sedge occurs in deciduous forests, often along streams or in seepage areas, fens, or springs (Ball et al. 2002); it is considered imperiled in South Carolina (NatureServe Explorer 2010; SCDNR 2012b). Allegheny-spurge is a groundcover species that occurs in woodlands (NatureServe Explorer 2010) and is considered imperiled in South Carolina (NatureServe Explorer 2010; SCDNR2012b).

Building Impacts

Building activities for two nuclear units on the Keowee site would remove about 297 ac of high-quality wooded habitat (Duke 2010g) and disturb about 3.5 ac of wetlands (Duke 2010g, 2011h). Site preparation for the railroad spur, transmission line, and cooling-water pipeline would remove approximately 60 ac of high-quality wooded habitat (Duke 2010g) and would disturb about 3 ac of wetlands (Duke 2010g, 2011h). Site preparation and inundation of the supplemental cooling-water reservoir would remove about 1000 ac of high-quality wooded habitat (Duke 2010g) and about 19 ac of wetlands (Duke 2010g, 2011h). Site preparation at the Keowee site and the ancillary facilities, and site preparation and inundation of the cooling-water reservoir, would affect 149,000 linear ft (approximately 28 mi) of streams (Duke 2010g, 2011h). The riparian corridors of about 127,000 linear ft (approximately 24 mi) of these streams would be permanently inundated by creation of the reservoir. It is uncertain to what extent riparian corridors would be affected along the other 22,000 linear ft (approximately 4 mi) of streams associated with the Keowee site and ancillary facilities, this would depend on the need to clear riparian vegetation (e.g., for transmission-line clearance), and the length of stream that would be so affected has not been determined (Duke 2011h). The overall impact of reservoir development on terrestrial resources would be noticeable and permanent.

One plant species ranked by the State as critically imperiled, three plant species ranked as imperiled, one plant species ranked as vulnerable, and two plant species varieties (one ranked as critically imperiled and the other ranked as vulnerable) could be affected by development of the Keowee site and associated facilities (Duke 2010g). Other Federally listed and State-ranked species that may be present in the project footprint (Table 9-12) could also potentially be affected. Impacts on wildlife at the Keowee site would be noticeable and similar to those described for the Lee Nuclear Station site in Section 4.3.1.

Operational Impacts

Impacts on terrestrial ecological resources from operation of two new nuclear units at the Keowee site would be minor and similar to those for the Lee Nuclear Station site as described in Section 5.3.1. There may be minor differences in operational impacts because of factors such as climate, topography, and elevation.

Cumulative Impacts

Overlaying the historic impacts in the Piedmont ecoregion discussed in the Site Description above are the current projects listed in Table 9-10. Projects located within the geographic area of interest include Oconee Nuclear Station Units 1, 2, and 3; two hydroelectric plants; an area of U.S. Department of Transportation (USDOT) highway infrastructure improvements; a fabric mill; a smelting plant; a motor products manufacturing facility; several wastewater-treatment facilities; areas of Federal and other grants to build wastewater-treatment and drinking-water facilities and green infrastructure; Jocassee Gorges Management Area; and Mile Creek County Park. The development of most of these projects has further reduced, fragmented, and degraded natural forests and wetland and riparian habitat and decreased habitat connectivity. In contrast, the Jocassee Gorges Management Area and Mile Creek County Park help conserve terrestrial resources in perpetuity. Reasonably foreseeable projects and land uses within the geographic area of interest that would affect terrestrial resources include ongoing silviculture, farming, and agricultural development, and residential and some limited commercial development.

Summary

Impacts on terrestrial ecology resources are estimated based on the information provided by Duke and the review team's independent review. Site preparation and inundation of the cooling-water reservoir, and site preparation and development of the Keowee site, new transmission-line corridor, water-pipeline corridor, and a railroad spur would affect a total of about 1357 ac of high-quality forest habitat, about 26 ac of wetlands, and about 28 mi of riparian corridor. The overall impact of these activities on habitat and wildlife would be noticeable and permanent, particularly in the watershed containing the reservoir. There are 64 Federally listed or State-ranked terrestrial taxa and 2 communities that potentially occur at the Keowee site and associated facilities that may be affected. There are past, present, and future activities in the geographic area of interest that have affected and would continue to significantly affect habitat and wildlife in ways similar to site preparation and development for the above facilities (i.e., silviculture, farming, and agricultural development, and residential and some limited commercial development).

The review team concludes that the cumulative impacts from past, present, and reasonably foreseeable future actions, including two new nuclear units at the Keowee site and associated facilities, on baseline conditions for terrestrial ecological resources in the geographic area of interest would be MODERATE. The incremental contribution to these impacts from building and operating two new nuclear units at the Keowee site would be significant. The impact could be greater if surveys revealed that Federally listed species are present.

9.3.4.4 Aquatic Resources

The following analysis includes impacts from building and operating the proposed new facilities on aquatic ecology resources at the Keowee site. The analysis also considers past, present, and reasonably foreseeable future actions that affect the aquatic ecological resources, including other Federal and non-Federal projects and the projects listed in Table 9-10. For the analysis of aquatic ecological impacts at the Keowee site, the geographic area of interest includes Lake Keowee and the Seneca River approximately 6 mi downstream to its junction with Lake Hartwell. This geographic region is considered the most likely to show impacts on water quality relative to the water-quality criteria for aquatic biota.

In developing this EIS, the review team relied upon reconnaissance-level information to perform the alternative site evaluation in accordance with ESRP 9.3 (NRC 2000a). Reconnaissance-level information is data that are readily available from agencies and other public sources such as scientific literature, books, and Internet websites. It also can include information obtained through site visits. To identify aquatic resources at the Keowee site, the review team relied primarily on the following information:

- Oconee Nuclear Station Final Environmental Report (Duke Energy 1998) and Environmental Impact Statement for license renewal (NRC 1999b)
- Lee Nuclear Station Joint Application for Activities Affecting Waters of the United States submitted by Duke (2011h) to the USACE
- a tour of the Keowee alternative site in April 2008 (NRC 2008d) and a tour of the Keowee alternative site and supplemental cooling-water reservoir site in August 2010 (NRC 2010c)
- responses to RAIs provided by Duke (2010g, 2010l)
- FWS Endangered Species Program database for South Carolina (FWS 2012a) and South Carolina Natural Heritage Program (SCDNR 2012j, 2012n, 2012o) county record searches
- correspondence regarding species occurrence from the SCDNR (SCDNR 2012b).

Site Description

The Keowee site is located immediately south of the Oconee Nuclear Station in the Savannah River drainage basin, and the two stations would have separate cooling-water intake and discharge structures. Lake Keowee and the Seneca River are the most important aquatic resources near the Keowee site.

The staff visited the Keowee site in April 2008 (NRC 2008d) and August 2010 (NRC 2010c). Although Lake Keowee is affected by housing developments, much of the shoreline is bordered by vegetation. There are areas where the shoreline is scoured and exposed due at least in part to fluctuating water levels.

Recreationally Important Species

Common and popular sport fish in Lake Keowee include Bluegill (*Lepomis macrochirus*), Redbreast Sunfish (*L. auritus*), Redear Sunfish (*L. microlophus*), Pumpkinseed (*L. gibbosus*), Black Crappie (*Pomoxis nigromaculatus*), White Crappie (*P. annularis*), Largemouth Bass, Striped Bass, and hybrid bass (White Bass *Morone chrysops* x Striped Bass *M. saxatilis*). Because of the low nutrient content of the water, Lake Keowee has a relatively low standing crop of fish. Data on angler effort and harvest rates collected over a period from 1974 to 1993 (Barwick et al. 1995) indicated that Largemouth Bass were the most important sport fish in the reservoir and that sunfish (*Lepomis* spp., including Bluegill) and crappie were the only other species that contributed in a significant way to the reservoir's sport fishery. Striped Bass are another popular sport fish that can be found in the Seneca River.

Non-Native and Nuisance Species

Algae have never been present in nuisance concentrations in Lake Keowee (NRC 1999b). However, South Carolina reports that at least one aquatic plant species (*Hydrilla verticillata*) and several invasive fish species may be present. The fish include the Spotted Bass, White Perch (*Morone americana*), and Green Sunfish (*Lepomis cyanellus*) (SCDNR 2008c).

Federally Listed and State-Ranked Species

Duke provided no new field survey information for the Keowee site beyond its partial characterization in 1998 for the Oconee Nuclear Station license renewal ER (Duke Energy 1998). During that survey no Federally listed species or State-listed aquatic species were found within a 1-mi radius of the Oconee Nuclear Station. The review team is unaware of any field surveys performed at the sites of the proposed cooling-water reservoir, the transmission-line corridor, water-pipeline corridor, or railroad-spur corridor. The presence/absence of listed species in the project footprint cannot be ascertained without field surveys.

A recent review of the Federally listed and State-ranked aquatic species that may occur in Anderson, Oconee, and Pickens Counties near the Keowee site was performed by the review team. No Federally listed aquatic species were identified (FWS 2012a). State-ranked species included three fish, the Carolina Fantail Darter (*Etheostoma brevispinum*), Banded Darter (*E. zonale*), and Blacknose Dace (*Rhinichthys obtusus*); Carlson's polycentropus caddisfly (*Polycentropus carlsoni*); and eel-grass (*Vallisneria americana*) (SCDNR 2012j, n, o). In addition, although not State-ranked, the Carolina Darter is assigned a State protection status of threatened (SCDNR 2012n). The State ranking (in addition to the Federal listing) provides the only common basis for comparison of numbers and important aquatic species among the proposed and alternative sites located in North Carolina and South Carolina. Of the species listed in Table 9-13, the Carolina Darter, Banded Darter, and Carlson's polycentropus caddisfly have been positively identified by the State as occurring within 15 mi of the Keowee site (SCDNR 2012b).

Table 9-13. Aquatic Federally Listed Species and State-Ranked Species in Anderson, Oconee, and Pickens Counties, South Carolina

Scientific Name	Common Name	Federal Status[(a)]	SC State Rank/ Protection Status[(b)]	Counties of Occurrence[(c)]
Fish				
Etheostoma brevispinum	Carolina Fantail Darter	---	S1/---	Pickens
Etheostoma collis	Carolina Darter	---	SNR/T	Anderson
Etheostoma zonale	Banded Darter	---	S1?/---	Oconee, Pickens
Rhinichthys obtusus	Blacknose Dace	---	S1/---	Oconee
Insect (with aquatic life stage)				
Polycentropus carlsoni	Carlson's polycentropus caddisfly	---	S1S3/---	Pickens
Aquatic plant				
Vallisneria americana	eel-grass		S1	Anderson

(a) Federal status: (FWS 2012a).
(b) State rank: S1 = critically imperiled, S2 = imperiled, S3 = vulnerable, S#S# = a numeric range rank used to indicate uncertainty about the exact status of the element, SNR = unranked; State protection status: T = threatened (SCDNR 2012j, n, o).
(c) Counties of Occurrence: SCDNR 2012j, n, o.

Carolina Darter

The Carolina Darter has a South Carolina state protection status of threatened and is designated as a species of high conservation priority by SCDNR (2005). This small (up to 6-cm long) fish is typically found in small upland creeks and rivulets in both wooded and pasture areas in pools or slow-moving runs and often among vegetation that includes brush and fallen tree limbs (NatureServe Explorer 2010). They are difficult to sample in such habitat. The Carolina Darter exists only in the Piedmont region from south-central Virginia through North Carolina and into north-central South Carolina, and natural heritage records exist for the species in Anderson County, South Carolina (SCDNR 2005; NatureServe Explorer 2010). Watershed distribution maps indicate the species is currently found in the Seneca/Savannah River Basin (NatureServe Explorer 2010). Because no recent surveys have been conducted specifically looking for Carolina Darters in the vicinity of the Keowee site, it is possible that the species could be present, and could potentially be affected by station building activities and/or operation.

Carolina Fantail Darter

Formerly known as the Fantail Darter (*Etheostoma flabellare*), the *E. flabellare brevispinum* subspecies was elevated to species level and is now known as *E. brevispinum* (Blanton and Schuster 2008). The Carolina Fantail Darter is ranked in South Carolina as an S1 species (critically imperiled) and is classified as a species of high priority on its Priority Conservation Species List (SCDNR 2005). The Carolina form of the Fantail Darter is endemic to the Piedmont and Blue Ridge sections of the Upper Pee Dee and Santee River drainages in the state (SCDNR 2005). This fish inhabits gravel riffles in small- to medium-sized rivers in strong currents and relies on rocky substrates for feeding and spawning. The Carolina form of the Fantail Darter is considered secure in North Carolina, but relatively little is known about its population size or trends in South Carolina (SCDNR 2005). It is not likely to be found in Lake Keowee but may inhabit portions of the Seneca River.

Banded Darter

The Banded Darter is a member of the family Percidae. It is ranked S1, critically imperiled, in South Carolina, and is given moderate conservation priority (SCDNR 2005). In South Carolina, the species is restricted to the Seneca River system in the upper Savannah River drainage. However, outside the state, the species has a wide distribution, extending from Minnesota to New York and south to northern Alabama and Georgia (SCDNR 2005). There have been no records of the Banded Darter from the Seneca River drainage since 1986, making it possible that the species has been extirpated from the state (SCDNR 2005). Although it is highly unlikely to be present in the vicinity of the Keowee alternative site, because no recent surveys have been conducted specifically looking for the Banded Darter in the vicinity of the Keowee site, it is possible that the species could be present and could potentially be affected by station building activities and/or operation.

Blacknose Dace

The Blacknose Dace is ranked S1, critically imperiled, in the State of South Carolina and is identified as a species of moderate conservation priority (SCDNR 2005). The Blacknose Dace is found in the upper Savannah River drainage in South Carolina, which includes Pickens County. It prefers small- to medium-sized creeks with cool waters, slow-to-rapid current, and a mixed substrate consisting of sand, gravel, and rock. Therefore, this species is not likely to inhabit Lake Keowee. Because much of this fish's habitat has been protected in the Mountain Bridge Wilderness Area at Jones Gap State Park in Marietta, South Carolina (more than 20 mi northeast of the Keowee site), the species is considered stable within its entire range, which stretches north to Canada (SCDNR 2005).

Carlson's Polycentropus Caddisfly

In South Carolina, this caddisfly species is only known from a few sites in the Upper Piedmont, including a Seneca River watershed site in Pickens County (NatureServe Explorer 2010). It is ranked S1S3 (Table 9-13, footnote [b]) in South Carolina. Because little is known about this species and no recent species-specific surveys have been conducted in the vicinity of the Keowee site, it is possible that the species could be present and could potentially be affected by station building and/or operating two new nuclear units at the Keowee site.

Eel-Grass

A member of the tape-grass family (Hydrocharitaceae), eel-grass is found in tidal freshwater marsh where the average annual salinity is less than 0.5 parts per thousand, as well as in clear lakes and in flowing waters of clear streams and small rivers (Nelson 1986; USACE 2012c). Not a true grass, eel-grass is a native submerged aquatic vegetation species distributed across much of the United States. The plants are considered a beneficial food source for waterfowl and are sometimes planted for wildlife and fish habitat (USACE 2012c). However, large colonies sometimes interfere with boating and fishing because the long, ribbon-like leaves can reach 3 ft in length and can fill narrow or shallow waterways (USACE 2012c). Eel-grass is State-ranked (S1, critically imperiled) in South Carolina and has been documented in Anderson County (SCDNR 2012n), but not within 15 mi of the Keowee site (SCDNR 2012b). Efforts to establish additional native eel-grass plants to combat the spread of non-native species such as *Hydrilla* have been undertaken in some parts of the State (SCDNR 2012q).

Critical Habitats

No critical habitat has been designated by FWS or NMFS in the vicinity of the Keowee site.

Building Impacts

Building impacts would likely include impacts on water quality from direct (e.g., dredging, shoreline excavation, clearing, impoundment, etc.) and indirect sources (e.g., stormwater runoff, sedimentation, etc.). Two new reactor units at the site would require cooling-water intake and discharge systems. The cooling-water intake structure for two new nuclear units at the Keowee site would be located on Lake Keowee. Duke did not provide details of the effluent discharge location. However, it is standard practice for power plants to design cooling-water intake and effluent discharge locations such that recirculation of discharged effluent to the intake does not occur. Operation of new facilities at the Keowee site would require one offsite supplemental cooling-water reservoir (1300 ac [Duke 2010g] with approximately 80,000 ac-ft of storage [Duke 2010l]) and ancillary facilities consisting of a railroad spur, a transmission line, and a cooling-water pipeline (Duke 2010g). The new site, reservoir, and ancillary facilities would affect up to 149,000 linear ft (approximately 28 mi) of streams, which includes conversion of 127,000 linear ft of stream from a lotic to lentic ecosystem for the supplemental cooling-water reservoir

(Duke 2010g). Building activities would also affect a total of 15 ac of open water (10 ac associated with the site, 2.3 ac associated with the reservoir, and 2.8 ac associated with ancillary features) (Duke 2011h). The impacts of building two new nuclear units and one new reservoir on the aquatic ecology of Lake Keowee and the affected tributaries would be clearly noticeable.

A new transmission-line corridor would be needed to connect the site to the transmission system, as described in Section 9.3.4.1. A railroad spur would also be installed to transport building materials to the site. Impacts on aquatic resources from the transmission lines and railroad-spur installation would be similar to those described for the proposed Lee Nuclear Station site in Section 4.3.2.

Operational Impacts

Because a closed-cycle cooling system and supplemental cooling-water reservoir are proposed for the Keowee site, operational impacts would be expected to be similar to those for the Lee Nuclear Station site, as described in Section 5.3.2.

Cumulative Impacts

Current actions in the vicinity that have present and future potential impacts on aquatic ecological resources include operation of several energy-production facilities in the Keowee-Toxaway complex; discharge of water by domestic and industrial NPDES permit holders; withdrawal of water for domestic and industrial purposes; the existence of nature preserves; and future urbanization of the area (Table 9-10).

The existing Oconee Nuclear Station is part of Duke's integrated energy-producing area called the Keowee-Toxaway complex, which also includes a conventional hydroelectric facility and two pumped-storage hydroelectric facilities that use Lake Jocassee and the Bad Creek Reservoir. Lakes Keowee and Jocassee were both installed between 1968 and 1974 as part of the overall project. The Oconee Nuclear Station is situated on the south-central shore of Lake Keowee. These facilities have greatly modified aquatic habitat in the region and will continue to affect aquatic resources while they are operational.

During license renewal for the Oconee Nuclear Station, the NRC staff determined that entrainment and impingement impacts on fish and shellfish have been minor at the Oconee Nuclear Station (NRC 1999b). Operation of the existing Oconee facility, including thermal and chemical discharge, has not resulted in an evident impact on the recreational fish species of Lake Keowee or the Seneca River. In addition to the Oconee Nuclear Station NPDES-permitted discharge activity to the Keowee River, there is at least one minor NPDES permit currently authorized for discharge to Lake Keowee (EPA 2011m).

The Jocassee Gorges Management Area and Mile Creek County Park preserve some of the headwaters of the region near Lake Jocassee and a portion of Lake Keowee shoreline, thereby limiting the potential for future urbanization in those areas. Reasonably foreseeable projects and water uses within the geographic area of interest that would affect aquatic resources include building and operating new drinking-water facilities and water-treatment plants, farming and agricultural development, and residential and possibly some limited commercial development.

Summary

Impacts on aquatic ecology resources are estimated based on the information provided by Duke and the review team's independent review. Site preparation and inundation of the supplemental cooling-water reservoir, and site preparation and development of the Keowee site, new transmission-line corridor, water-pipeline corridor, and a railroad-spur corridor would affect about 149,000 linear ft (approximately 28 mi) of stream habitat and the associated aquatic species. The overall impact of these activities on aquatic habitat and biota would be noticeable and permanent, particularly in the tributary that would be impounded to create the supplemental cooling-water reservoir.

Five State-ranked aquatic species and one State-listed aquatic species potentially occur at the Keowee site and associated facilities that may be affected. Three of these species have been positively identified as occurring within 15 mi of the Keowee site (SCDNR 2012b).

There are past, present, and future activities in the geographic area of interest that have affected and would continue to significantly affect aquatic resources in ways similar to site preparation and development for the above facilities (i.e., surface and groundwater consumption, thermal and chemical discharges to waterbodies, farming, and agricultural development, and residential and some limited commercial development).

The review team concludes that the cumulative impacts from past, present, and reasonably foreseeable future actions, including two new nuclear units at the Keowee site and associated facilities, on baseline conditions for aquatic ecological resources in the geographic area of interest would be MODERATE. The incremental contribution to these impacts from building and operating two new nuclear units at the Keowee site would be significant. The impact could be greater if surveys reveal that Federally listed species are present.

9.3.4.5 Socioeconomics

For the analysis of socioeconomic impacts at the Keowee site, the geographic area of interest is considered to be the 50-mi region centered on the Keowee site with special consideration of the two-county area of Oconee and Pickens Counties, where the review team expects socioeconomic impacts to be the greatest. In evaluating the socioeconomic impacts of building and operations at the Keowee site in Oconee County, South Carolina, the review team undertook a reconnaissance survey of the region using readily obtainable data from the ER; the alternative site audit; and Federal, State, and local government agencies. The cumulative impacts analysis also considers other past, present, and reasonably foreseeable future actions that affect the same environmental resources, including other Federal and non-Federal projects and the projects listed in Table 9-10.

Socioeconomic impacts span the issues of physical impacts, demography, economic conditions and taxes, and infrastructure and community services. The impacts of building and operating the new units are discussed below.

Physical Impacts

Many physical impacts of building and operation would be similar regardless of the site. Building activities can cause temporary and localized physical impacts such as noise, odor, vehicle exhaust, vibration, shock from blasting, and dust emissions. The use of public roadways, railways, and waterways would be necessary to transport materials and equipment. Offsite areas that would support building activities (e.g., borrow pits, quarries, and disposal sites) would be expected to be already permitted and operational. Offsite activities would include the development of a supplemental pond, cooling-water pipeline, railroad spur, and new transmission-line corridor. No residential developments exist within the site boundaries but the site vicinity is experiencing low residential growth. The intake structure would be built in an area with high residential growth.

Potential impacts from station operation include noise, odors, exhausts, thermal emissions, and aesthetics. New units would produce noise from the operation of pumps, cooling towers, transformers, turbines, generators, and switchyard equipment. In addition, traffic at the site would be a source of noise. The review team assumed that the same standard noise protection and abatement procedures used for the Lee Nuclear Station site would be used to control noise at the Keowee site. Good road conditions and appropriate speed limits would minimize the noise level generated by the workforce commuting to the Keowee site.

The new units at the Keowee site would likely have standby diesel generators and auxiliary power systems. Permits obtained for these generators would ensure that air emissions comply with applicable regulations. In addition, the generators would be operated on a limited, short-term basis. During normal plant operation, new units would not use a significant quantity of chemicals that could generate odors that exceed odor detection threshold values. Good access roads and appropriate speed limits would minimize the dust generated by the commuting workforce.

The visual aesthetics of the area have already been altered by the Oconee Nuclear Station adjacent to the Keowee site; however, development of the intake structure in the middle of a high-level residential area would affect local residents. Building other ancillary facilities and the reservoir would affect aesthetics in the area. The review team concludes that the aesthetic impacts of building two units and its associated facilities at the Keowee site would be noticeable but not destabilizing. Once the reservoir is completed, aesthetic impacts from operation would be minimal.

Based on the information provided by Duke and the review team's independent evaluation, the review team concludes that other physical impacts of building and operating two new nuclear units at the Keowee site would be minimal except for a noticeable physical impact on aesthetics during the building phase.

Demography

The Keowee site is located in Oconee County, South Carolina (population 73,035) near the towns of Seneca (population 8024) and Clemson (population 13,596) to the southwest and southeast of the site, respectively. Clemson is located in Pickens County, South Carolina (population 117,823). During the summer months, the population in the vicinity increases due to people with summer homes along nearby lakes. The City of Anderson (population 26,566) is southeast of the site. Greenville, South Carolina (population 57,821), is also included in the 50-mi region (USCB 2010e).

Based on the proposed site location, the regional population distribution, and U.S. Census Bureau Journey to Work Data (USCB 2000h), the review team expects the in-migrating population would reside in the two-county area of Oconee and Pickens Counties. In 1999 during the operating license renewal of the Oconee Nuclear Station, adjacent to the Keowee site, approximately 79 percent of the workforce lived in Oconee County (891 employees) and Pickens County (515 employees) (NRC 1999b). The review team realizes that workers may choose to live in other counties within the 50-mi region but given the small number of workers and the large population base the review team expects impacts on other counties to be *de minimis.* Therefore, Oconee and Pickens Counties compose the economic impact area and are the focus of the following analysis.

At the peak of the nuclear power station development, Duke expects the workforce onsite to be approximately 4613 workers. Because the Keowee site is similar to the proposed Lee Nuclear Station site in geography and urbanization, development of the proposed new units on the Keowee site would have similar socioeconomic impacts in most respects to building the two units on the Lee Nuclear Station site. Based on the analysis of project impacts presented in Section 4.4.2, of the 4613 peak workers approximately 3191 workers would in-migrate into the region with some workers bringing a family for a total in-migrating population of 4516 people. Considering that the maximum estimate of in-migrating population is less than 1 percent of the existing regional population, the review team expects the demographic impacts of building two units on the Keowee site would be minimal. Once the plant is operational, Duke estimates the workforce to be about 957 workers with an estimated 345 migrating into the region, similar to the Lee Nuclear Station site. Based on the information provided by Duke and the review team's independent evaluation, the review team concludes that the demographic impacts of building and operating two new nuclear units at the Keowee site would be minimal.

Economic Impacts on the Community

Economy

The local labor force is dominated by manufacturing, government, and retail trade. Some of the top manufacturing employers are Duke (Oconee Nuclear Station), Itron (electronic measuring devices), Schneider Electric (motor control centers), and Timken U.S. Corp. (thrust bearings). Agriculture represents 19 percent (78,349 ac) of total Oconee County land area (Duke 2009c). Oconee County's 2009 total labor force was 31,884 with an unemployment rate of 13.7 percent. Pickens County's 2009 labor force was 58,194 with an unemployment rate of 10.8 percent. The 2006 unemployment rates for Oconee and Pickens County were 8.8 and 6.2 percent, respectively (BLS 2011a). The significant increase in unemployment rates between 2006 and 2009 is attributed to the recent economic downturn afflicting much of the country.

The wages and salaries of the project workforce would have a multiplier effect that would result in increases in business activity, particularly in the retail and service sectors. This multiplier effect would have a positive impact on the business community and could provide opportunities for new businesses and increased employment opportunities for local residents. The review team expects that most indirect jobs created in the region would be allocated to residents in the region. Expenditures made by the indirect workforce would also strengthen the regional economy. Because the review team assumes the economic impacts of the proposed site (in Section 4.4.3.1 and Section 5.4.3.1) also apply to the Keowee site, the review team concludes the impact of these new indirect jobs would constitute a small percentage of the total number of jobs in Oconee and Pickens Counties and would have a minimal and beneficial economic impact.

Taxes

If the proposed nuclear plant were located at the Keowee site, Duke would likely enter into a fee-in-lieu of taxes agreement with Oconee County as allowed by South Carolina State law. This agreement would be similar to the one discussed in Section 5.4.3.2. Without a fee-in-lieu agreement, Duke would pay taxes under the governance of South Carolina State law. This agreement would not go into effect until operations at the Keowee site have commenced. During the construction phase, Duke would continue to pay taxes on the land itself. In 2010, Oconee County property tax revenues were \$36 million of the County's \$54 million total revenues (Oconee County 2010). Based on the agreement Duke has with Cherokee County in regard to the Lee Nuclear Station, which has an assessment value of 2 percent for the fee-in-lieu-of-taxes payments during the first 20 years, Duke estimates Lee Nuclear Station annual payments would be \$11.8 million over 40 years of the license period. If Duke entered into a similar agreement for the Keowee site, the tax payments would increase Oconee County property tax revenues substantially. Total economic and tax impacts during building activities would have a minimal beneficial impact. The total fee-in-lieu-of-tax payment would be expected to be substantial and beneficial during operations in Oconee County and minimal for the rest of the region.

Infrastructure and Community Services

Traffic

Oconee County is served by I-85 at its southeast corner, plus US-76 and US-123 and South Carolina highway 28 (SC 28) and Scenic SC 11. The Keowee site is accessible from Keowee River Road, a two-lane highway (SC 37). This highway provides service to the site conveniently from four main directions (Duke 2009c). A railroad spur would need to be built for the transport of materials and equipment to the site, and there is residential area near the site (Duke 2009c). One road would require widening, another would be relocated, and a new access road would be developed (Duke 2009c). Given the large number of additional vehicles added to the roads during peak construction, the review team expects traffic-related impacts from building the plant at the Keowee site would be noticeable on roads near the site. The review team expects traffic-related impacts from operations of a nuclear power station on the Keowee site to be minimal.

Housing

Based on the analysis in Section 4.4.2, approximately 3191 workers would migrate into the region during the peak employment period of the building phase. Later, approximately 345 operations workers would migrate into the region by the time the plant becomes operational. The 2006–2010 ACS estimate for Oconee County indicated a total housing stock of 37,713 units, of which 7803 were vacant (USCB 2010e). Pickens County had 50,854 housing units, of which approximately 6806 were vacant (USCB 2010e). The review team expects that the in-migrating construction workforce could be absorbed fairly easily into the existing housing stock in the region and the impact would be minimal.

Based on the information provided by Duke and the review team’s independent evaluation, the review team concludes that traffic-related and housing impacts of building two new nuclear units at the Keowee site would be minor across the region with the exception of a noticeable traffic-related impact on roads near the site. Because of the much lower number of operations-related workers relative to workers during the building phase, the review team determined traffic-related and housing impacts from operations would be minimal.

Recreation

Recreational activities near the Keowee site are plentiful. Oconee County is in the foothills of the Appalachian Mountains and includes rivers, lakes, forest, and waterfalls. Oconee State

Park is 5 mi to the west, Keowee-Toxaway State Natural Area is 10 mi to the north, and Lake Keowee is 1 mi from the site. Keowee Lake hosts permanent and vacation residences, campgrounds, boat launches, marinas, and golf courses. During the summer months, the population within 10 mi of the site exceeds 25,000 people due to those who summer on Lake Keowee and Lake Hartwell (Duke 2009c). The supplemental reservoir would not be available for public recreation at any of the alternative sites or the proposed site. Duke has not indicated that recreational activities on Lake Keowee would be limited during building or operation of a nuclear project. Other recreational areas are far enough offsite not to be affected. Therefore, the review team expects impacts on recreation would be minimal for both building and operating two new nuclear units at the Keowee site.

Public Services

The influx of construction workers and plant operations staff settling in the region could affect local municipal water and water-treatment facilities, police, fire, medical, and other social services in the area. Oconee County has three water suppliers for a total of 18.9 Mgd and a utilization of 9.9 Mgd. The only wastewater-treatment plant in the county has a 7.8 Mgd capacity and a current utilization of 3.2 Mgd (Upstate Alliance 2009a). There is currently excess capacity in these systems sufficient to accommodate a new nuclear plant and the in-migration of workers and their families. The impact on public services would depend on the infrastructure that is developed on the site as well as the location in which the in-migrating workforce chooses to live. The in-migrating workers would represent a small portion of the total populations of Oconee and Pickens Counties and the review team expects they would have a minimal impact on public services.

Education

Oconee County has 19 schools with an overall kindergarten through 12th grade enrollment for the 2010–2011 school year of 10,606 students (NCES 2013). Pickens County has 25 schools in the county's district with a 2010–2011 student enrollment of 16,319. The review team expects, based upon the same underlying assumptions that governed the analysis for the proposed Lee Nuclear Station site, that approximately 400 students would move into the two-county area during the peak employment period for building activities. Assuming equal distribution of those students between counties, 200 additional students in each school district would represent a less than 5 percent increase in the student body population. Therefore, the review team determined building a nuclear facility on the Keowee site would have a minimal impact on education, and that the much smaller operations workforce would also have a minimal impact on education. Based on the information provided by Duke and the review team's independent evaluation, the review team concludes that public services and education impacts of building and operating two new nuclear units at the Keowee site would be minor.

Summary of Building and Operation Impacts

Physical impacts on workers and the general public include impacts on existing buildings, transportation, aesthetics, noise levels, and air quality. Social and economic impacts span issues of demographics, economy, taxes, infrastructure, and community services. In summary, based on information provided by Duke and the review team's independent evaluation, the review team concludes that the adverse cumulative impacts on socioeconomics of building and operating a new nuclear plant at the Keowee site on socioeconomics would be minor for most of the region but would be noticeable, but not destabilizing, in terms of traffic-related and aesthetics impacts during peak project employment. During operations, these impacts are expected to be minimal. The impacts on the Oconee County tax base during operations likely would be substantial and beneficial; however, only minor beneficial tax impacts would result in the rest of the region.

Cumulative Impacts

The projects identified in Table 9-10, particularly the future urbanization of the region, have contributed or would contribute to the demographics, economic climate, and community infrastructure of the region and generally result in increased urbanization and industrialization. Because the projects within the review area identified in Table 9-10 would be consistent with applicable land-use plans and control policies, the review team considers the cumulative socioeconomic impacts from the projects to be minimal.

For the analysis of socioeconomic impacts at the Keowee site, the geographic area of interest is considered to be the 50-mi region centered on the Keowee site, with special consideration of Oconee and Pickens Counties, where the review team expects socioeconomic impacts to be the greatest.

The Keowee site is located in eastern Oconee County on the Oconee and Pickens County border adjacent to the existing Oconee Nuclear Station operated by Duke. The employment in the area near the Keowee site is a mixture of manufacturing, government, and retail trade with Duke being the largest employer with its Oconee Nuclear Station. The majority of the Oconee Nuclear Station's workforce lives in Oconee and Pickens Counties. The nearest towns are Seneca (population 8024) located to the southwest and Clemson (population 13,596) (USCB 2010e)located southeast in Pickens County. The large metropolitan area of Greenville is located east of the Keowee site.

The cumulative impact analysis considers other past, present, and reasonably foreseeable future actions that could contribute to the cumulative socioeconomic impacts on a given region, including other Federal and non-Federal projects and the projects listed in Table 9-10. Adverse cumulative impacts would include physical impacts (on workers and the local public, buildings, transportation, and aesthetics), demographics impacts, and impacts on local infrastructures and community services (transportation; recreation; housing; water and wastewater facilities; police, fire, and medical services; social services; and education).

Because most projects described in Table 9-10 do not include any significant reasonably foreseeable changes in socioeconomic impacts within 50 mi of the Keowee site, the review team determined there would be no significant additional cumulative socioeconomic impacts in the region from those activities. Regional planning efforts and associated demographic projections available at a reconnaissance level formed the basis for the review team's assessment of reasonably foreseeable future impacts. Any economic impacts associated with activities listed in Table 9-10 would have been considered as part of the socioeconomic baseline.

The cumulative economic impacts on the community would be beneficial and SMALL with the exception of Oconee County, which would see a LARGE and beneficial cumulative impact on taxes. The cumulative infrastructure and community services impacts are SMALL with the exception of a MODERATE and adverse cumulative impact on traffic near the Keowee site. The cumulative physical impacts are SMALL with the exception of a MODERATE and adverse impact on aesthetics near the site. Building and operating the proposed units at the Keowee site would be a significant contributor to the LARGE and beneficial economic impact on taxes in Oconee County and also to the MODERATE and adverse impact on infrastructure and community services related to traffic near the site and the MODERATE physical impact on aesthetics. The review team concludes that building two nuclear units at the Keowee site, in addition to other past, present, and reasonably foreseeable future projects would have SMALL cumulative impacts on demography.

9.3.4.6 Environmental Justice

The 2006–2010 ACS5-year population estimates at the census block group level were used for identifying minority and low-income populations in the region, employing the same sources and methodology explained in Section 2.6.1 for the proposed site, including a closer look at potential areas of interest using a series of health and physical considerations. There were a total of 949 census block groups within the 50-mi region (USCB 2011a, c). Approximately 96 of these census block groups were classified as aggregate minority populations of interest and 59 classified as African American populations of interest. There was 1 census block group with American Indian or Alaskan Native, 3 with Asian, 9 with "other" race, and 36 with Hispanic populations of interest. Oconee County had 7 African American, no Hispanic, and 1 aggregate minority census block groups with minority populations of interest. There were 84 census block groups classified as having low-income populations of interest in the 50-mi region, 4 of which were in Oconee County. There were 9 low-income census block groups adjacent to the site in Pickens County. The review team did not identify any Native American communities or other minority communities with the potential for a disproportionately high and adverse impact due to their unique characteristics or practices. Figure 9-6 shows the geographic locations of the

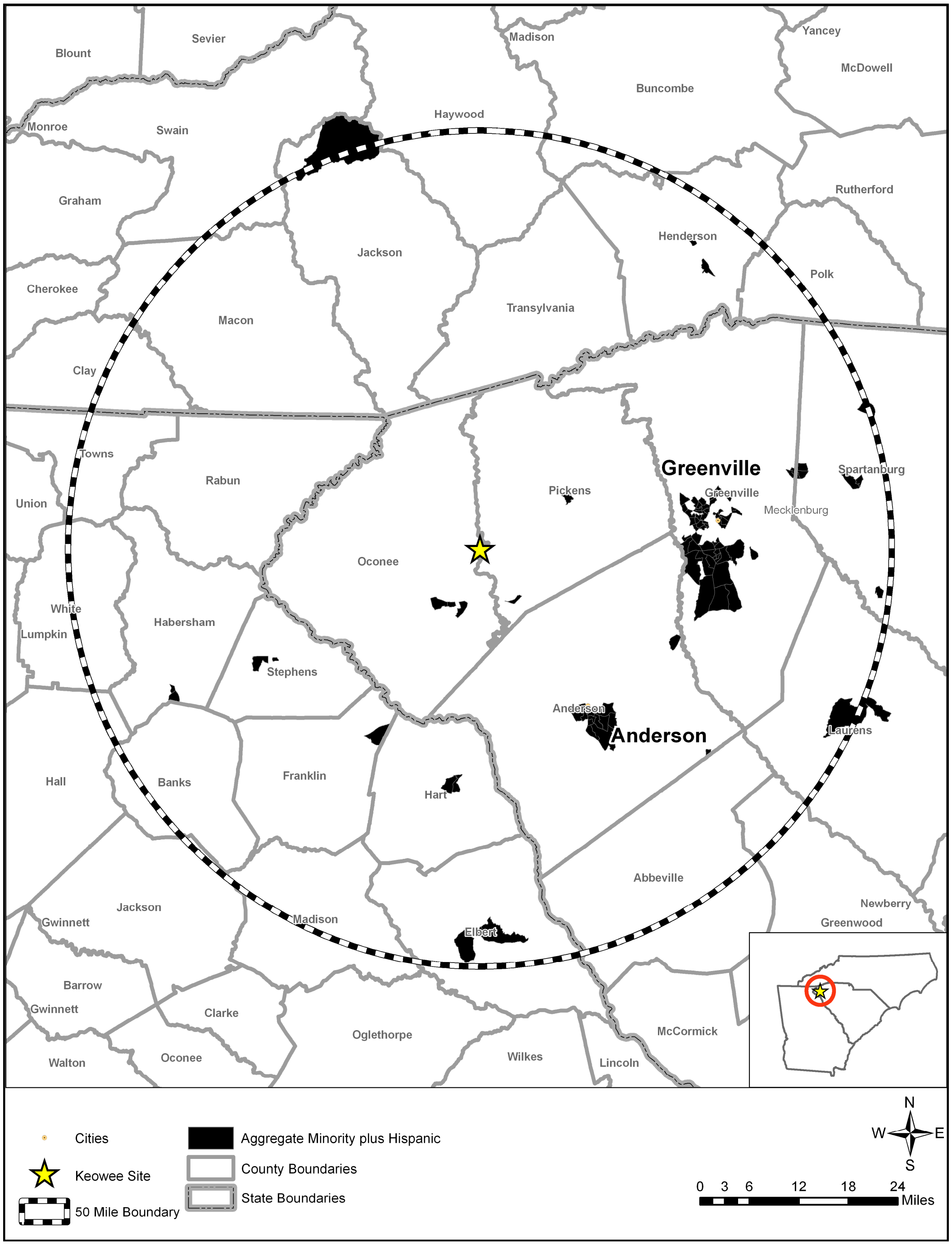

Figure 9-6. Aggregate Minority Populations in Block Groups that Meet the Environmental Justice Selection Criteria at the Keowee Site (USCB 2011a, c)

minority populations of interest within the 50-mi radius of the Keowee site, and Figure 9-7 shows the geographic locations of the low-income populations of interest within the 50-mi radius of the Keowee site.

Physical impacts from building activities (e.g., noise, fugitive dust, air emissions, and traffic) attenuate rapidly with distance, topography, and intervening vegetation. Therefore, the review team determined that, given the distance from the Keowee site to the nearest populations of interest, there would be no physical impacts with a disproportionately high and adverse effect on minority or low-income populations. For the same reasons, the review team determined the operation of the proposed project at the Keowee site is also unlikely to have a disproportionately high and adverse impact on minority or low-income populations. A supplemental water reservoir near the site would be needed, which would require acquiring private property from current residents and demolishing houses. New transmission-line corridors would be constructed to link the proposed units to the electric grid through the Oconee Station. The location of the pond is unknown but given the distance between the Keowee site and the location of minority populations of interest, impacts from the supplemental water pond and transmission-line corridors would not disproportionately and adversely affect minority populations. All land needed for the supplemental reservoir would be acquired similar to land acquisitions for Make-Up Pond C and all residents would be compensated. Though there are low-income populations of interest near the site, impacts from the supplemental pond and transmission-line corridors would not disproportionally and adversely affect low-income populations. See Sections 2.6, 4.5, and 5.5 for more information about environmental justice criteria and impacts.

In addition to environmental justice impacts from building and operations, the cumulative analysis considers other past, present, and reasonably foreseeable future actions that could contribute to disproportionately high and adverse impacts on minority and low-income populations, including other Federal and non-Federal projects and the projects listed in Table 9-10. For the analysis of environmental justice impacts at the Keowee site, the geographic area of interest is considered to be the 50-mi region centered on the Keowee site.

The projects identified in Table 9-10 likely did not or would not contribute to environmental justice impacts of the region. Therefore, based on information provided by Duke and the review team's independent evaluation, the review team concludes there would not be any disproportionately high and adverse environmental justice cumulative impacts from the building and operation of two nuclear units at the Keowee site in addition to other past, present, and reasonably foreseeable future projects, and the cumulative environmental justice impacts would be SMALL.

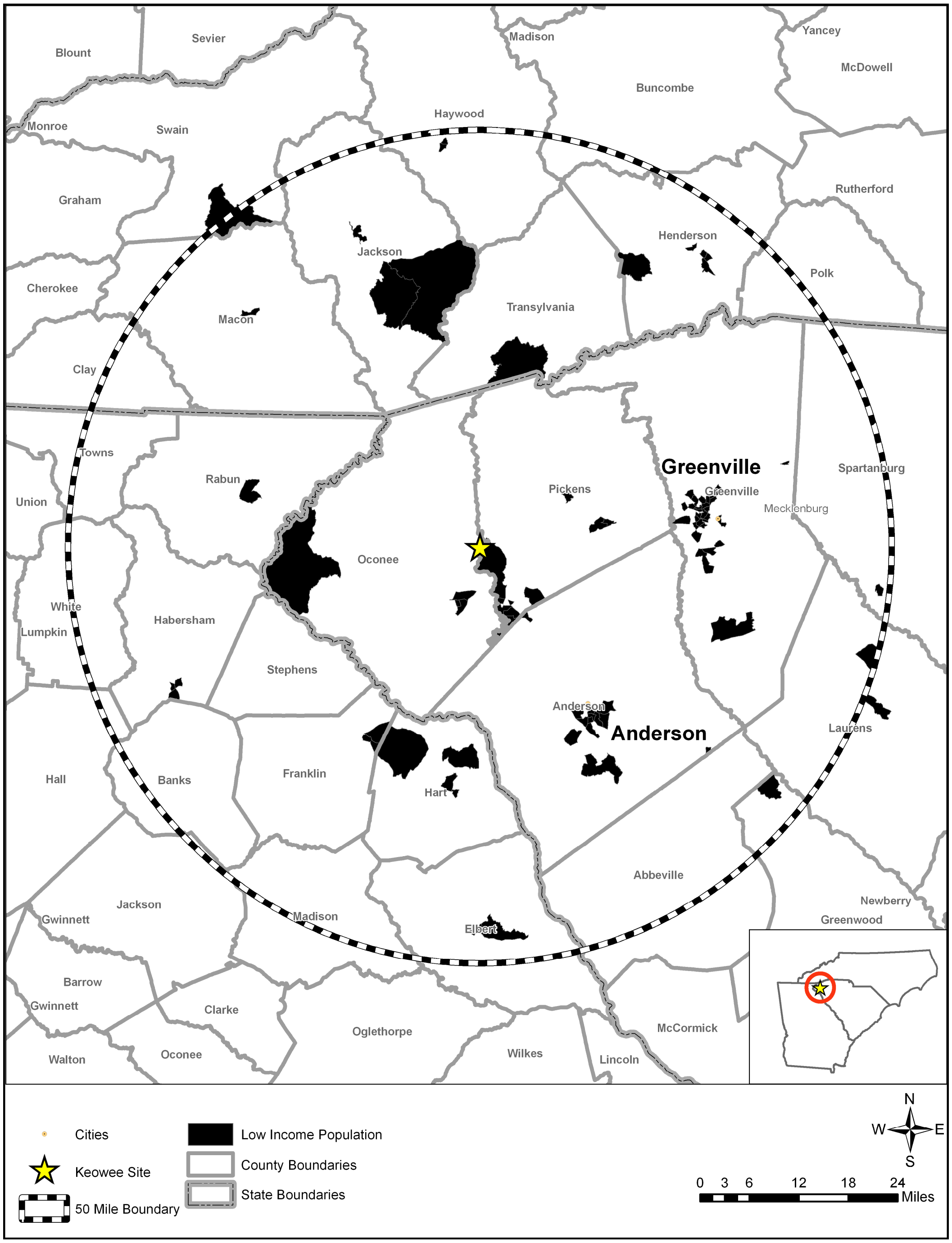

Figure 9-7. Low-Income Populations in Block Groups that Meet the Environmental Justice Selection Criteria at the Keowee Site (USCB 2011a, c)

9.3.4.7 Historic and Cultural Resources

The following analysis includes impacts on historic and cultural resources from building and operating two new nuclear generating units at the Keowee site in Oconee County, South Carolina. The analysis also considers other past, present, and reasonably foreseeable future actions that could cause cumulative impacts on cultural resources, including other Federal and non-Federal projects as listed in Table 9-10. For the analysis of cultural resources impacts at the Keowee site, the geographic area of interest is considered to be the onsite and offsite direct, physical and indirect, visual APEs associated with the proposed undertaking. This includes direct, physical APEs, defined as the onsite areas directly affected by site development and operation activities, as well as offsite areas such as railroad corridors, transmission lines, and new reservoirs. Indirect visual APEs are also included and defined generally as a 1-mi radius buffer around the proposed direct physical APEs, which encompasses the approximate maximum distance from which tall structures could be seen.

Reconnaissance activities in a cultural resources review have particular meaning. Typically such activities include preliminary field investigations to confirm the presence or absence of historic properties or cultural resources. However, in developing this EIS, the review team relied upon reconnaissance-level information to perform the alternative sites evaluation in accordance with ESRP 9.3 (NRC 2000a). In this context, reconnaissance-level information is data that are readily available from agencies and other public sources. It can also include information obtained through site visits. To identify historic and cultural resources at the Keowee site, the review team relied on the following information:

- the Oconee Nuclear Station ER for Operating License Renewal (Duke Energy Corp 1998), Lee Nuclear Station COL ER (Duke 2009c)
- an August 2010 informal tour of the Keowee site and visit to the South Carolina Room at the Anderson County Public Library in Anderson, South Carolina (NRC 2010c)
- archival records searches, National Register listings, and cultural resources probability assessments provided by Duke (Duke 2010t)
- the National Park Service's listing of properties on the National Register (NPS 2011b).

Site Description

Historically, the Keowee site and vicinity were largely undisturbed and contained intact archaeological resources associated with the past 10,000 years of human settlement. After European colonization, cotton cultivation became common on lands throughout the area. Only limited formal cultural resources investigations have been performed within the study area and no surveys have covered the direct physical APEs considered in this analysis (Duke 2010t).

Duke completed records searches at the South Carolina Department of Archives and History and the South Carolina Institute of Archaeology and Anthropology to assemble a list of previously recorded cultural resources and historic properties listed, or eligible for listing, on the National Register that could be affected if the Keowee site was selected for nuclear plant development (Duke 2010t). According to the search results, no cultural resources investigations have been completed within the onsite direct physical APE for the proposed new units or the associated reservoir and only limited investigations have been completed in the 1-mi buffer areas that constitute the indirect visual APEs for these developments. The limited surveys completed have resulted in the identification of seven cultural resources in the indirect visual APE for the new units, including one Native American mound site, five prehistoric archaeological sites, and one National Register-listed historic property. One historic cemetery has been previously recorded within the indirect visual APE for the proposed reservoir. Simple predictive modeling analyses completed by Duke (Duke 2010g) further indicate that approximately 70 percent of the lands included in the direct physical APE for the new units, 57 percent of the lands in the direct physical APE for the new reservoir, and 80 percent of the lands in the both of the associated indirect visual APEs exhibit high potential for additional cultural resources (i.e., well-drained soils, less than 15 percent slope, outside active floodplains or areas of seasonal or permanent inundation, largely undisturbed). The South Carolina SHPO has confirmed that no historic or cultural resources are known to exist at the nearby Oconee Nuclear Station (Duke Energy 1998).

Building and Operation Impacts

In the event that the Keowee site was chosen for the proposed project, the review team assumes that Duke would employ the same methods for identifying and assessing impacts on historic properties and cultural resources as those used during assessments at the Lee Nuclear Station site and associated developments. This would include field investigations and coordination with the South Carolina SHPO, interested American Indian Tribes, and the public that would be conducted before the initiation of any ground-disturbing activities. The results of these investigations and communications would be used in the site planning process to avoid or mitigate impacts and develop protective measures for any significant resources such as those already listed on the National Register. Duke is committed to this approach for the Lee Nuclear Station site and the review team assumes that Duke would employ the same methods at alternative sites, if chosen for the proposed project (Duke 2009c). Initial archival searches indicate that appropriate mitigations would need to be developed for potential visual or other indirect impacts from the new units on one National Register-eligible Native American mound site that may also have traditional cultural significance for American Indian Tribes and one National Register-listed historic architectural property. Additional important historic and cultural resources may also be discovered during new surveys in all APEs. As a result, impacts on cultural resources due to site development and building activities could be noticeable, but not destabilizing with appropriate mitigations implemented.

Impacts on historic and cultural resources from operation of the two new nuclear units at the Keowee site as well as parallel and related operations at offsite components such as the new reservoir, railroad line, and short transmission-line corridors would be possible. The review team assumes that Duke Energy's corporate policy for consideration of cultural resources and associated procedures in the event of an unanticipated discovery of cultural resources would apply to operations at the Keowee site and offsite areas (Duke 2009c). Further, the review team assumes that Duke would negotiate an agreement and associated cultural resources management plan for the Keowee site with the South Carolina SHPO, the USACE, and interested American Indian Tribes similar to efforts completed for the Lee Nuclear Station site (USACE et al. 2013). Interested American Indian Tribes may also be included in this consultation to address potential operational impacts on the Native American mound site located near the Keowee site. Under consistent application of Duke Energy's corporate policy for cultural resources and an agreement and cultural resources management plan specific to the Keowee site, impacts on cultural resources due to operations would be negligible.

Cumulative Impacts

The geographic area of interest for cumulative impacts on historic and cultural resources at the Keowee site corresponds to the onsite and offsite direct (physical) and indirect (visual) APEs defined for the site. As indicated in Table 9-10, past actions in the geographic area of interest that could have affected historic and cultural resources in a manner similar to those associated with the building and operation of the two new units and other project components include the building and operation of the Oconee Nuclear Station and the Keowee Hydroelectric Generating Plant. However, South Carolina SHPO records indicate that no historic or cultural resources are known at the Oconee plant (Duke Energy 1998), so these impacts were likely negligible. Sources at the Anderson County Library indicate that many significant historic and cultural resources were inundated by Lake Keowee and impacts may have also occurred as the associated hydroelectric plant was built (NRC 2010c). Table 9-10 also lists future projects that may similarly affect historic and cultural resources and contribute to cumulative impacts in the geographic area of interest, including transportation improvements associated with the South Carolina Strategic Corridor System Plan (SCDOT 2009b) and new developments associated with future urbanization in the region. These projects could affect historic and cultural resources through ground-disturbance or visual impacts on historic settings or architectural properties, but the inclusion of Federal funding in most of these efforts should ensure appropriate mitigation.

Summary

Cultural resources are non-renewable; therefore, the impact of destruction of cultural resources is cumulative. Based on the information provided by Duke and the review team's independent evaluation, the review team concludes that the cumulative impacts from the past development of the Oconee Nuclear Station and Keowee Hydroelectric Generating Plant, future Federal transportation improvements and urbanization of the area, and the proposed building and operation of two new nuclear units on the Keowee site would be MODERATE. The incremental contribution of building and operating the two new units and associated plant components would be significant to these cumulative impacts given the National Register-listed historic property and potentially sensitive Native American mound site known to exist within the onsite indirect, visual APEs and the geographic area of interest.

9.3.4.8 Air Quality

The following impact analysis includes impacts on air quality from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect air quality, including other Federal and non-Federal projects listed in Table 9-10. The air-quality impacts related to building and operating a nuclear facility at the Keowee site would be similar to those at the Lee Nuclear Station site.

The Keowee site is located in Oconee County, South Carolina, which is part of the Greenville-Spartanburg Intrastate Air Quality Control Region (40 CFR 81.106). The geographic area of interest for this resource area is a 50-mi radius of the site, which includes Oconee County. Designations of attainment or nonattainment are made on a county-by-county basis. Oconee County is designated as being unclassified or in attainment for all criteria pollutants for which the NAAQSs have been established (40 CFR 81.341). Criteria pollutants include ozone, PM, CO, No_x, SO_2, and lead. The closest Class 1 Federal Area (i.e., Shining Rock Wilderness Area, North Carolina) is approximately 40 mi from the Keowee site and it would, therefore, not likely be affected by minor source emissions from the site. Class I areas are considered of special national or regional natural, scenic, recreational, or historic value and are afforded additional air quality protection.

As described in Section 4.7, emissions of criteria pollutants from building the two units are expected to be temporary and limited in magnitude. As discussed in Section 5.7, emissions of criteria pollutants from operations would be primarily from the intermittent use of standby diesel generators and pumps. Given the temporary air emissions from construction and intermittent air emissions from operation, and that Oconee County is currently designated as being unclassified or in attainment for criteria pollutants, the review team concludes the impacts from building and operating two new nuclear units on air quality would be minimal.

Cumulative impacts on air quality resources are estimated based on the information provided by Duke and the review team's independent evaluation. Of the projects listed in Table 9-10, only one project (the BASF Corporation) is considered a major source of NAAQS criteria air pollutants in Oconee County. Other past, present, and reasonably foreseeable activities exist in the geographic area of interest that could affect air quality resources. The impacts on criteria pollutants in Oconee County from emissions of effluents from the Keowee site, the nearby BASF project, and other projects and activities within 50 mi of the region would not be noticeable.

The greenhouse gas emissions from two nuclear units at the Keowee site would be the same as those analyzed in Chapters 4, 5, and 6 for the Lee Nuclear Station site. The cumulative impacts of greenhouse gas emissions related to nuclear power are discussed in Section 7.6. The impacts of the emissions are not sensitive to location of the source. Consequently, the conclusion in Sections 7.6—national and worldwide impacts of greenhouse gas emissions are noticeable but not destabilizing—is applicable to two AP1000 reactors located at the Keowee site.

The review team concludes that the cumulative impacts, including those from other past, present, and reasonably foreseeable future actions on air quality resources in the geographic area of interest would be SMALL for criteria pollutants and MODERATE for greenhouse gas emissions. The incremental contribution of impacts on air quality resources from building and operating two units at the Keowee site would not be significant. The incremental contribution of impacts on air quality resources from building and operating two units at the Keowee site would not be significant to the MODERATE air-quality impact from greenhouse gas emissions.

9.3.4.9 Nonradiological Health Impacts

The following analysis considers nonradiological health impacts from building and operating two new nuclear units at the Keowee alternative site. Impacts on nonradiological health at the Keowee site are estimated based on the information provided by Duke and the review team's independent evaluation. The analysis also includes past, present, and reasonably foreseeable future actions that could contribute to cumulative nonradiological health impacts on site workers and the public, including other Federal and non-Federal projects and the projects listed in Table 9-10. For the analysis of nonradiological health impacts at the Keowee site, the geographic area of interest is the immediate vicinity surrounding the Keowee site and the associated transmission-line corridors. This area of interest is based on the localized nature of nonradiological health impacts.

Building activities with the potential to affect the health of members of the public and workers at the Keowee site include exposure to dust, vehicle exhaust, and emissions from construction equipment; noise; occupational injuries; and the transport of construction materials and personnel to and from the site. The operation-related activities that may affect the health of members of the public and workers include exposure to etiological agents, noise, occupational injuries, EMFs, and impacts from the transport of workers to and from the site.

Building Impacts

Nonradiological health impacts on construction workers and members of the public from building two new nuclear units at the Keowee alternative site would be similar to those evaluated in Section 4.8 for the proposed Lee Nuclear Station site. Duke would comply with applicable Federal and State regulations on air quality and noise during the site preparation and building phase. The frequency of construction worker accidents would not be expected to be different from the frequency of accidents estimated for the Lee Nuclear Station site.

Section 4.8.3 concluded that the impacts on nonradiological health from the transport of construction workers and materials to and from the Lee Nuclear Station site would be minimal. The alternative sites range from about 31 percent lower impacts for the Middleton Shoals, South Carolina, site to 24 percent lower impacts for the Perkins, North Carolina, site than the estimated impacts for the Lee Nuclear Station site. These differences are due solely to differences in the average State-specific fatality rates used for construction workers. Transportation impacts on nonradiological health at the Keowee site would be minimal.

The Keowee site is located on a greenfield site directly adjacent to an existing, currently operational nuclear facility, surrounded by low- and high-density residential development (Duke 2009c). This site would require extensive grading to develop the proposed plant. Building activities, including associated transmission lines and the offsite supplemental cooling-water reservoir at the Keowee site, could create minimal to noticeable temporary air quality (i.e., fugitive dust and emissions from construction equipment) and transportation impacts in the vicinity of the site.

Operational Impacts

Nonradiological health impacts from operation of two new nuclear units on site workers and members of the public at the Keowee site would be similar to those evaluated in Section 5.8 for the proposed Lee Nuclear Station site. Occupational health impacts on workers (e.g., falls, electric shock or exposure to other hazards) at the Keowee site would likely be the same as those evaluated for workers at the Lee Nuclear Station site. Exposure to the public from waterborne etiological agents at the Keowee site would be similar to the types of exposures evaluated in Section 5.8.1, and the operation of the new nuclear units at the Keowee site would not likely lead to an increase in waterborne diseases in the vicinity due to thermal effluent limitations prescribed in the plant NPDES permit. Noise and EMF exposure would be monitored and controlled in accordance with applicable OSHA regulations. Effects of EMF on human health would be controlled and minimized by conformance with NESC criteria (IEEE 2012).

The impacts of transporting operations workers to and from the Keowee site range from about a 2 to 6 percent increase in traffic fatalities in the counties in which the alternative sites are located. These differences arise from differences in the average State-specific fatality rates used for operations workers and the county-specific baseline annual fatalities. Because these increases are small relative to the baseline traffic fatalities (i.e., before the new units are constructed) in the counties where Duke has proposed to build the new units, the review team concludes that the impacts of transporting construction materials and personnel to and from the alternative sites would be minimal. The review team concludes that impacts on site worker and public nonradiological health from the operation of the two nuclear units at the Keowee alternative site would be minimal.

Cumulative Impacts

Past actions in the geographic area of interest that have similarly affected nonradiological health include the development of the Oconee Nuclear Station Units 1, 2 and 3, located adjacent to the Keowee site and the development of the Keowee Hydroelectric Station, located approximately 1 mi north of the Keowee site. Development of these sites would have caused temporary, localized impacts on nonradiological health, but current operation of these facilities would not be expected to contribute significantly to cumulative impacts. The hydroelectric station and the nuclear stations would be expected to have very low rates of air emissions (associated with periodic use of backup generators), and cumulative transportation-related impacts associated with the operation of those facilities would be minimal (as discussed above). The Oconee Nuclear Station discharges thermal effluents to the Little River arm of Lake Keowee, but the station holds a current NPDES permit that imposes limitations on the temperature of the thermal discharge (NRC 1999b), and the Station's contribution to cumulative impacts affecting the presence of thermophilic organisms would be minimal. There are no other major current projects in the geographic area of interest that would have a cumulative impact on nonradiological health in a similar way to the development of the Keowee site.

There are no proposed future actions that would affect nonradiological health in a way similar to development at the Keowee site. However, transmission-line creation and/or upgrading in the vicinity of the Keowee site and future urbanization would be expected to occur.

The review team is also aware of the potential climate changes that could affect human health—a recent compilation of the state of knowledge in this area (GCRP 2009) has been considered in the preparation of this EIS. Similar to the Lee Nuclear Station site, projected changes in the climate for the southeastern region of the United States during the life of the proposed nuclear station include a 2 to 3°F increase in average temperature and a decrease in precipitation in winter, spring, and summer, and an increase in precipitation in fall (GCRP 2009). This may result in a small, gradual increase in river water temperature, which may alter the presence of microorganisms and parasites in Lake Keowee. While the changes that are attributed to climate change in these studies (GCRP 2009) may not be insignificant on a national or global level, the review team did not identify anything that would alter its conclusion regarding the presence of etiological agents or change the incidence of waterborne diseases in the vicinity of the Keowee site. The review team concludes that the cumulative impacts on nonradiological health from building two new nuclear units, associated transmission lines, and an offsite reservoir at the Keowee site would be minimal.

Summary

Impacts on nonradiological health from building and operating two new units at the Keowee site are estimated based in the information provided by Duke and the review team's independent evaluation. The review team concludes that nonradiological health impacts on construction workers and the public resulting from the building of two new nuclear units, associated transmission lines, and offsite reservoir at the Keowee site would be minimal. The review team also expects that the occupational health impacts on members of the public and operations workers from two new nuclear units at the Keowee site would be minimal. Finally, the review team concludes that cumulative nonradiological health impacts from related past, present, and future actions in the geographic area of interest would be SMALL. As discussed in Section 5.8, the NRC staff is not able to come to a conclusion on the chronic impacts of EMFs.

9.3.4.10 Radiological Health Impacts of Normal Operations

The following impact analysis includes radiological impacts on the public and workers from building activities and operations for two nuclear units at the Keowee alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health, including other Federal and non-Federal projects and the projects listed in Table 9-10. As described in Section 9.3.4, the Keowee site is a greenfield site; there are currently no nuclear facilities on the site. The geographic area of interest is the area within a 50-mi radius of the Keowee site. The only facility potentially affecting radiological health within this geographic area of interest is the existing Oconee Nuclear Station, located about 1 mi north of the Keowee site. In addition, medical, industrial, and research facilities that use radioactive material are likely to be within 50 mi of the Keowee site.

The radiological impacts of building and operating the proposed two AP1000 units at the Keowee site include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways would result in low doses to people and biota offsite that would be well below regulatory limits. The impacts are expected to be similar to those at the Lee Nuclear Station site.

The radiological impacts of Oconee Units 1, 2, and 3 include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways result in low doses to people and biota offsite that are well below regulatory limits, as demonstrated by the ongoing radiological environmental monitoring program conducted around the Oconee Nuclear Station. The NRC staff concludes that the dose from direct radiation and effluents from medical, industrial, and research facilities that use radioactive material would be an insignificant contribution to the cumulative impact around the Keowee site. This conclusion is based on data from the radiological environmental monitoring programs conducted around currently operating nuclear power plants. Based on the information provided by Duke and the NRC staff's independent analysis, the NRC staff concludes that the cumulative radiological impacts from building and operating the two proposed AP1000 units and other existing and planned projects and actions in the geographic area of interest around the Keowee site would be SMALL.

9.3.4.11 Postulated Accidents

The following impact analysis includes radiological impacts from postulated accidents from the operation of two nuclear units at the Keowee alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health from postulated accidents, including other Federal and non-Federal projects and the projects listed in Table 9-10. As described in Section 9.3.4, the Keowee site is adjacent to the existing Oconee Nuclear Station site. The geographic area of interest considers all existing and proposed nuclear power plants that have the potential to increase theprobability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Keowee alternative site. Facilities potentially affecting radiological accident risk within this geographic area of interest are the existing Oconee Units 1, 2, and 3 and VCSNS Unit 1. In addition, COLs have been issued for two units (Units 2 and 3) and are under construction at the VCSNS site. Nuclear Fuel Services Inc., located in Erwin, Tennessee, is also within the geographic area of interest.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of DBAs at the Lee Nuclear Station site would be minimal for AP1000 reactors. DBAs are addressed specifically to demonstrate that a reactor design is robust enough to meet NRC safety criteria. The AP1000 design is independent of site conditions, and the meteorology of the Keowee alternative and Lee Nuclear Station sites are similar; therefore, the NRC staff concludes that the environmental consequences of DBAs at the Keowee alternative site would be minimal.

Assuming the meteorology, population distribution, and land use for the Keowee alternative site are similar to the proposed Lee Nuclear Station site, risks from a severe accident for an AP1000 reactor located at the Keowee alternative site are expected to be similar to those analyzed for the proposed Lee Nuclear Station site. The risks for the proposed Lee Nuclear Station site are presented in Tables 5-14 and 5-15 and are well below the median value for current-generation reactors. In addition, as discussed in Section 5.11.2, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028). For existing plants within the geographic area of interest (Oconee Units 1, 2, and 3 and VCSNS Unit 1), the Commission has determined that the probability-weighted consequences of severe accidents are small (10 CFR Part 51, Appendix B, Table B-1). Finally, according to the *Final Environmental Impact Statement for Combined Licenses for Virgil C. Summer Nuclear Station Units 2 and 3*, NUREG-1939 (NRC 2011f), the risks from VCSNS Units 2 and 3 would also be well below risks for current-generation reactors and would meet the Commission's safety goals. There is no irradiated fuel located at Nuclear Fuel Services, Inc., and the facility is designed to prevent inadvertent criticalities; therefore, the additional risk is not significant in the evaluation of the cumulative severe accident risk for a nuclear power plant at the Keowee site. On this basis, the NRC staff concludes that the cumulative risks from severe accidents at any location within 50 mi of the Keowee alternative site would be SMALL.

9.3.5 The Middleton Shoals Site

This section covers the review team's evaluation of the potential environmental impacts of siting two nuclear units at the Middleton Shoals site located in Anderson County, South Carolina. The following sections describe the cumulative impact assessment conducted for each major resource area. The specific resources and components that could be affected by the incremental effects of the proposed action if it were implemented at the Middleton Shoals site, and other actions in the same geographic area were considered. This assessment includes the impacts of NRC-authorized construction, operations, and preconstruction activities. Also included in the assessment are other past, present, and reasonably foreseeable Federal, non-Federal, and private actions that could have meaningful cumulative impacts when considered together with the proposed action if implemented at the Middleton Shoals site. Other actions and projects considered in this cumulative analysis are described in Table 9-14.

Table 9-14. Past, Present, and Reasonably Foreseeable Projects and Other Actions Considered in the Middleton Shoals Alternative Site Cumulative Analysis

Project Name	Summary of Project	Location	Status
Nuclear Energy Projects			
Oconee Nuclear Station, Units 1, 2, and 3	Nuclear power generating plant with 3 units (846 MW(e) each)	Approximately 38 mi north of the Middleton Shoals site	Oconee's three units are currently operational and are licensed through February 6, 2033, October 6, 2033, and July 19, 2034 (NRC 2012a)
VCSNS Unit 1	Nuclear power generating plant with one unit (966 MW(e))	Approximately 81 mi east of the Middleton Shoals site	VCSNS Unit 1 is currently operational and is licensed through August 6, 2042 (NRC 2012a)
VCSNS Units 2 and 3	Nuclear power generating plant with two Westinghouse AP1000 pressurized water reactors	Approximately 81 mi east of the Middleton Shoals site	Proposed operation would begin in 2016 and 2019 (NRC 2011f). COLs issued March 30, 2012 (NRC 2012a)

Table 9-14. (contd)

Project Name	Summary of Project	Location	Status
VEGP	Nuclear power generating plant with two units, VEGP 1 (1109 MW(e)) and VEGP 2 (1127 MW(e))	Approximately 95 mi south-southeast of the Middleton Shoals site	VEGP's two units are operational and licensed through January 16, 2047 and February 9, 2049 (NRC 2012a)
VEGP Units 3 and 4	Nuclear power generating plant with two Westinghouse AP1000 pressurized water reactors	Approximately 95 mi south-southeast of the Middleton Shoals site	Combined licenses and limited work authorizations issued February 10, 2012 (NRC 2012a, 2012k). Proposed operation would be in 2016 for Unit 3 and 2017 for Unit 4.
Coal and Natural Gas Energy Projects			
John Rainey Generating Station	A 1095-MW, six-unit natural-gas-fired peaking facility	Approximately 6 mi north-northwest of Middleton Shoals site	Operational (EPA 2010an, Santee Cooper 2013)
Hartwell Energy Facility	A two-unit, 360-MW natural-gas-fired facility operated by Oglethorpe Power	Approximately 7 mi northwest of the Middleton Shoals site	Proposed upgrading existing plant controls including turbines (ARRA 2011, EPA 2010ap)
Lee Steam Station	A three-unit, 370-MW coal-fired power plant operated by Duke Energy	Approximately 29 mi northeast of the Middleton Shoals site	Operational (Duke Energy 2010p)
Plant Carl	A 25-MW generating plant fueled by wood and poultry waste	Approximately 35 mi west of the Middleton Shoals site	Proposed (GDNR 2009)
Plant Dahlberg	A ten-unit, 810-MW natural-gas-fired generating plant operated by Southern Company	Approximately 41 mi west of the Middleton Shoals site	Operational (GDNR 2010a) An additional 4 units are proposed (GDNR 2010b)
Buzzard Roost Combustion Turbine Station	A 196-MW oil/gas-fired peaking facility	Approximately 48 mi east of Middleton Shoals site	Operational (Duke Energy 2011e)

Table 9-14. (contd)

Project Name	Summary of Project	Location	Status
Various small-scale fossil and cogeneration generating facilities	Fossil fuel-fired and cogeneration facilities	Throughout the 50-mi region	Operational
Hydroelectric Energy Projects			
Hartwell Dam and Lake	USACE dam with four 85-MW units and one 80-MW unit	On the Savannah River approximately 8 mi northwest of the Middleton Shoals site	Operational (USACE 2010a)
Hartwell Power Plant Federal Contract	$290,000 funded to upgrade existing plant controls, including turbines	Within 15 mi	In progress (ARRA 2011)
Richard B. Russell Dam and Lake	USACE dam with four 75-MW turbines	On the Savannah River approximately 18 mi south-southeast of the Middleton Shoals site	Operational (USACE 2010b)
Keowee Hydroelectric Station	A 158-MW two-unit hydroelectric facility operated by Duke Energy	Approximately 38 mi north of the Middleton Shoals site	Operational (Duke Energy 2010q)
Yonah Hydroelectric Generating Plant	A 22-MW three-unit hydroelectric facility operated by Georgia Power	In Georgia, approximately 45 mi northwest of the Middleton Shoals site	Operational (Georgia Power 2010)
Buzzard's Roost Dam	A 15-MW hydroelectric facility operated by Greenwood County, South Carolina	Approximately 48 mi east of the Middleton Shoals site	Operational (FERC 2011b)
Tugalo Hydroelectric Generating Plant	A 22-MW hydroelectric facility operated by Georgia Power	In Georgia, approximately 47 mi northwest of the Middleton Shoals site	Operational (Georgia Power 2010)
Jocassee Hydroelectric Station	A 610-MW four-unit pumped-storage hydroelectric facility operated by Duke Energy	On the Keowee River approximately 49 mi north-northeast of the Middleton Shoals site	Operational (Duke Energy 2010r)

Table 9-14. (contd)

Project Name	Summary of Project	Location	Status
Tallulah Falls Hydroelectric Generating Plant	A 75-MW hydroelectric facility operated by Georgia Power	In Georgia, approximately 50 mi northwest of the Middleton Shoals site	Operational (Georgia Power 2010)
J. Strom Thurmond Dam and Lake	USACE dam with seven 40-MW turbines	On the Savannah River approximately 52 mi southeast of the Middleton Shoals site	Operational (USACE 2010c)
Various small-scale hydroelectric projects located on dams, including Ware Shoals Hydroelectric Project, Rocky River Project, Pelzer Upper and Lowe Hydroelectric Projects, and Barnett Shoals.	Run-of-river and dam storage hydroelectric projects ranging from 1–6 MW	Throughout the 50-mi region	Operational (USSD 2010)
Other Energy Projects			
DOE SRS	Research and industrial complex	Approximately 91 mi southeast of the Middleton Shoals site	Operational (DOE 2009c)
Transportation Projects			
South Carolina Strategic Corridor System Plan	Strategic system of corridors forming the backbone of the State's transportation system	Statewide	Planning document with no explicit schedules; however, many strategic corridors coincide with routes that would/could be used for development at the Middleton Shoals site[j]
Anderson County Transportation Grant	$14.7 million funded to improve highway infrastructure	Within 20 mi	In progress (ARRA 2011)
National Forests			
Sumter National Forest	371,000-ac national forest	Throughout 40- to 50-mi region	Currently managed by U.S. Forest Service (USFS 2004a)

Table 9-14. (contd)

Project Name	Summary of Project	Location	Status
Chattahoochee – Oconee National Forests	750,000-ac Chattahoochee National Forest, and 115,000-ac Oconee National Forest	Throughout 40- to 50-mi region	Currently managed by U.S. Forest Service (USFS 2004b). Recent land transfers have added additional acreage to the managed forest (USFS 2010b)
Other Facilities			
Mohawk Industries Rocky River Plant	Yarn spinning mill	Approximately 11 mi southeast of the Middleton Shoals site	Operational (EPA 2010aq)
Owens Corning	Pressed and blown glass and glassware	12 mi northeast of the Middleton Shoals site	Operational (EPA 2010ar)
Milliken and Co. Sharon Plant	Fabric mill	Approximately 12 mi east of the Middleton Shoals site	Operational (EPA 2010as)
Eliskim Inc.	Hazardous waste management	14 mi northeast	Operational (EPA 2004)
Michelin Starr Plant	Tire manufacturing	Approximately 14 mi north of Middleton Shoals	Operational (EPA 2011n)
Plastic Omnium Auto Exterior	Motor vehicle parts manufacturing	Approximately 20 mi north of Middleton Shoals	Operational (EPA 2011o)
Hydro Aluminum North America	Aluminum extruded products	Approximately 23 mi northeast of Middleton Shoals site	Operational (EPA 2011p)
Medline Industries	Fabricated rubber products	Approximately 23 mi northeast of Middleton Shoals site	Operational (EPA 2011q)
Michelin Sandy Springs Plant	Tire manufacturing	Approximately 23 mi north of Middleton Shoals site	Operational (EPA 2011r)
Milliken Pendleton Plant	Fabric finishing	Approximately 28 mi north of Middleton Shoals	Operational (EPA 2011s)

Table 9-14. (contd)

Project Name	Summary of Project	Location	Status
Milliken-Cushman Plant	Fabric mill	Approximately 28 mi northeast of Middleton Shoals	Operational (EPA 2011t)
Fibertech Columns Inc.	Plastic products	Approximately 31 mi north of Middleton Shoals site	Operational (EPA 2011u)
Big Creek East Waste Water Treatment Plant	Improvements to take effluents out of Saluda River	Approximately 29 mi northeast of the Middleton Shoals site	Operational. Proposed improvements funded (ARRA 2011).
Various wastewater-treatment plants	Municipal wastewater treatment	Various locations throughout the region	Operational
Surface mines including the Threlko Pits, the Little River Sand Company Mine, and the Anderson Quarry	Surface mining operations for construction materials	Various locations within the region	Operational
Little River Sand Company Mine	Construction sand and gravel	15 mi east of the Middleton Shoals site	Operational (EPA 2010at)
Hanson Aggregates Southeast Incorporated Anderson Quarry	Crushed and broken granite	11 mi northeast of the Middleton Shoals site	Operational (EPA 2010au)
Mearl Corp Sfm Div	Dimension stone	13 mi west of the Middleton Shoals site	Operational (EPA 2010av)
Mohawk Industries Rocky River Plant	Yarn-spinning mills	11 mi southeast of the Middleton Shoals site	Operational (EPA 2010aw)
S&S Const/Broadway Pit	Miscellaneous nonmetallic minerals	15 mi northeast of the Middleton Shoals site	Operational (EPA 2010ax)
Threlko/Bob Quinn Pit	Miscellaneous nonmetallic minerals	13 mi southeast of the Middleton Shoals site	Operational (EPA 2010ay)
Threlko/Frank Hodges Pit #2.1	Miscellaneous nonmetallic minerals	15 mi southeast of the Middleton Shoals site	Operational (EPA 2010az)
Threlko/Pit #4	Miscellaneous nonmetallic minerals	16 mi southeast of the Middleton Shoals site	Operational (EPA 2010ba)
Threlko/Pit #5	Miscellaneous nonmetallic minerals	14 mi southeast of the Middleton Shoals site	Operational (EPA 2010bb)
Threlko/Pit #6	Miscellaneous nonmetallic minerals	14 mi southeast of the Middleton Shoals site	Operational (EPA 2010bc)

Table 9-14. (contd)

Project Name	Summary of Project	Location	Status
Threlko/Roger Pit #4.1	Miscellaneous nonmetallic minerals	16 mi southeast of the Middleton Shoals site	Operational (EPA 2010bd)
Vulcan Const Mat/Anderson Quarry	Crushed and broken granite	18 mi Northeast of the Middleton site	Operational (EPA 2010be)
Other Actions/Projects			
Elberton Energy Efficiency Grant	$66,000 funded to improve energy efficiency and reduce fossil fuel emissions	Within 20 mi	In progress (ARRA 2011)
Hartwell Lake, Dam, Power Plant, and Clemson Pumping Station Federal Contract	$1.5 million funded to construct five or six campsites/recreational sites, perform shoreline stabilization work, clean power plant foundation drains, and construct restroom facilities at recreation sites	Within 15 mi	In progress (ARRA 2011)
Department of Commerce Grant to Hart County	$1.4 million funded to expand broadband access across Georgia by building four new access points to offer affordable high-speed services to underserved areas	Within 20 mi	In progress (ARRA 2011)

Table 9-14. (contd)

Project Name	Summary of Project	Location	Status
Abbeville Community Grant	$10 million funded to Abbeville community to modernize and make long-term investments in infrastructure and public facilities that will assist residents living in areas with high unemployment and low income, help prevent crimes, a separate grant for highway infrastructure used anywhere, as well as another highway infrastructure grant to improve transportation.	Within 25 mi	In progress (ARRA 2011)
Various hospitals	Medical isotopes	Within 50 mi	Operational in Abbeville, Greenwood, Laurens, Anderson, McCormick, Pickens, Greenville, Oconee Counties, SC, and Hart, Stephens, Banks, Franklin, Jackson, Madison Elbert, Oglethorpe, Wilkes, Clarke, Greene, Taliaferro, Lincoln, McDuffie and Columbia Counties, NC
Commercial dairies and poultry farms	Commercial production of animal products	Throughout the 50-mi region	Operational
ARRA-funded grant for safe drinking water	$1.3 million funded to the town of Iva for improving drinking-water facilities, green infrastructure, program administration, and drinking-water-related activities	Within 10 mi of the Middleton Shoals site	In progress (ARRA 2011)

Table 9-14. (contd)

Project Name	Summary of Project	Location	Status
Star-Iva Water and Sewer District Grants and Loans	$15.5 million funded to improve and update the water lines and water-storage tank and related appurtenances	Within 10 mi of the Middleton Shoals site	In progress (ARRA 2011)
TEPA Federal Contract for navigation barriers on Russell Lake	$101,000 funded to aid navigation (boat barrier) on Russell Lake	Within 10 mi of the Middleton Shoals site	Completed (ARRA 2011)
Future Urbanization	Construction of housing units and associated commercial buildings; roads, bridges, and railroad; construction of water- and/or wastewater-treatment and distribution facilities and associated pipelines, as described in local land-use planning documents.	Throughout region.	Construction would occur in the future, as described in State and local land-use planning documents. Current projects include public infrastructure development and refurbishment projects funded by the American Recovery and Reinvestment Act of 2009.

Middleton Shoals is a greenfield site located on the eastern bank of the Savannah River, approximately 8 mi downstream of Hartwell Dam. The Middleton Shoals site has been maintained as forestland. The site would require extensive grading and cut-fill activities to support a two-unit nuclear power facility. Figure 9-8 shows the Middleton Shoals site region.

The Savannah River forms the western boundary of the site; US-187 and US-184 converge and form the eastern boundary of the site, and US-184 also provides the southern boundary. Iva, South Carolina, is approximately 6 mi east of the site and Anderson, South Carolina, is approximately 15 mi north of the site.

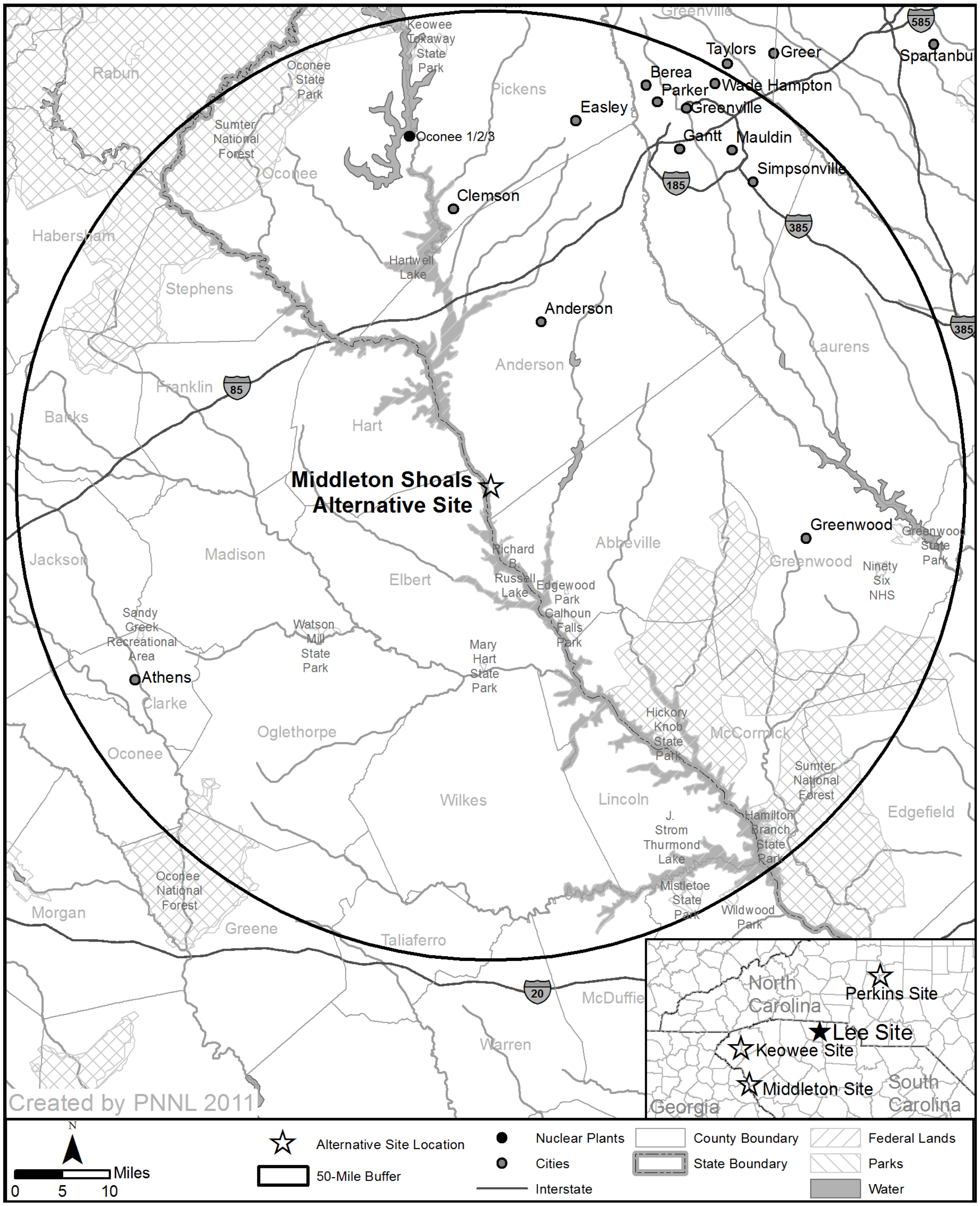

Figure 9-8. The Middleton Shoals Site Region

9.3.5.1 Land Use

The following analysis addresses impacts on land use from building and operating two new nuclear generating units at the Middleton Shoals site in Anderson County, South Carolina. In addition to land-use impacts from building and operations, the cumulative analysis for the Middleton Shoals site considers other past, present, and reasonably foreseeable future actions that could contribute to the cumulative land-use impacts, including other Federal and non-Federal projects and the projects listed in Table 9-14.

Site Description

The Middleton Shoals site is located in Anderson County, South Carolina, south of the town of Anderson, near the northwest border of South Carolina on the Savannah River/Russell Reservoir, and downstream from the Hartwell Dam. The site is not in the coastal zone. Anderson County is primarily rural with significant agricultural activities. To the north of Anderson County is Pickens County, South Carolina, which includes the town of Clemson. Also included in the 50-mi region of the Middleton Shoals site are the large metropolitan areas of Greenville, South Carolina and Athens, Georgia. Several State, U.S., and interstate highways currently traverse the area.

The Middleton Shoals site is a greenfield site (Duke 2009c), and would require extensive grading and development of an offsite supplemental water reservoir for low-flow events (Duke 2010g). The site grade elevation is 550 ft with a maximum flood elevation of 450 ft; therefore, no flood plains exist onsite (Duke 2009c). Very little residential development exists on or in the vicinity of the site where the supplemental pond and ancillary facilities would be built. SC 187 and SC 184 meet near the site and connect to SC 81 and SC 181.

Building and Operation Impacts

Based on information provided by the applicant and the review team's independent assessment, development of the proposed new units would require about 450 ac on the Middleton Shoals site (Duke 2009c) and a 3700-ac supplemental cooling reservoir offsite (Duke 2010g). A 15.3-mi railroad spur would have to be built to support construction deliveries. Widening of current roads, realignment of 7 mi of road, and development of a new access road would also be needed. Approximately 12.6 mi of transmission-line corridor would be built as well as 1 mi of cooling-water pipeline (Duke 2010g). When routing the transmission line, Duke would avoid populated areas and residences; however, land currently used for forests or timber production would be altered. These areas would be replaced with grasses and other types of ground cover (Duke 2009c). Table 9-15 summarizes expected land-use impact parameters for the Middleton Shoals site, supplemental reservoir, and ancillary facilities.

Table 9-15. Land-Use Impact Parameters for the Middleton Shoals Site

Parameter	Value	Source
Required project area	450 ac	Duke (2009c)
Number of supplemental water reservoirs	1	Duke (2009c)
Supplemental water reservoirs, area required	3700 ac	Duke (2010g)
Ancillary facilities	560 ac	Duke (2010g)
Number of new transmission-line routes	1	Duke (2010g)
Total transmission-line corridor distance (270-ft-wide corridor)	12.6 mi	Duke (2010g)
Railroad spur distance (100-ft-wide corridor)	15.3 mi	Duke (2010g)
Cooling-water pipeline (50-ft-wide corridor)	1.0 mi	Duke (2010g)
Road realignment (100-ft-wide corridor)	7.0 mi	Duke (2010g)

Cumulative Impacts

For the analysis of land-use impacts at the Middleton Shoals site, the geographic area of interest is considered to be the 50-mi region centered on the Middleton Shoals site, which includes all transmission-line corridors. Land-use planning for transmission-line routing over wide areas must consider land-use plans of adjoining counties and other land-managing agencies, rather than considering one county in isolation. Furthermore, in predominantly rural settings such as that surrounding the Middleton Shoals site, land-use changes occurring substantial distances away from a project site can substantially influence land-use planning decisions close to the site. Roads and other public facilities and services in rural areas tend to serve people who are spread thinly but broadly over large portions of the landscape. Therefore land-use changes can affect roads and other facilities at greater distances than similar changes in more densely populated areas.

The proposed project would indirectly result in land conversions to residential areas, roads, and businesses to accommodate growth, new workers, and services related to the proposed nuclear facility. Other reasonably foreseeable projects in the area that could contribute to an increase in urbanization include potential development of new residences within easy commuting distance of the new plant and the development and upgrading of local roads and highways. Because the other projects described in Table 9-14 do not include any reasonably foreseeable changes in land-use types within 50 mi of the Middleton Shoals site, other than general growth and urbanization development, there would not be any significant additional cumulative impacts on land use from those activities.

As described above, building the proposed facilities, new transmission-line corridors, inundation for a supplemental water reservoir, and building the water intake and railroad spur to support the new units may affect as much as 4710 ac of land. The overall impact of these activities on land use would be noticeable and permanent, particularly in the area containing the supplemental reservoir. If additional transmission lines are built from other energy projects, there would be a further cumulative land-use impact from the additional amount of land converted to utility corridor use for transmission lines. Because transmission lines are often co-located and are relatively narrow, the review team expects that the cumulative impact would be consistent with the land-use plans and zoning regulations of the affected counties. Nonetheless, consistent with previous discussions, new transmission-line corridors could noticeably alter the land-use classification acreage proportions within the geographic area of interest.

Due to the potential reclassification of acreage within the region for the project, the transmission-line development and the supplemental reservoir, the review team concludes that the cumulative land-use impacts associated with the proposed project at the Middleton Shoals site and other projects in the geographic area of interest would be MODERATE. Considering the land needs noted above, building and operating two new nuclear units at the Middleton Shoals site would be a significant contributor to these impacts.

9.3.5.2 Water Use and Quality

This section describes the review team's assessment of impacts on water use and quality associated with building and operating two new nuclear units at the Middleton Shoals site. The assessment also considers other past, present, and reasonably foreseeable future actions that affect water use and quality, including the other Federal and non-Federal projects listed in Table 9-14. The Middleton Shoals site hydrology, water use, and water quality are discussed in the ER (Duke 2009c) and in the response to RAIs (Duke 2010l).

The geographic area of interest for the Middleton Shoals site is considered to be the drainage basin of the Savannah River upstream and downstream of the site because this is the resource that would be affected if the proposed project were located at the Middleton Shoals site. For groundwater, the geographic area of interest is limited to the site because Duke has indicated no plans for use of groundwater to build and operate the plant (Duke 2009c).

The cooling- and service-water supply for a two-unit nuclear generating station located at the Middleton Shoals site would be Russell Reservoir. The USACE manages Russell Reservoir and Duke notes that "supplemental make-up cooling water would be required at the Middleton Shoals site whenever the USACE declares a drought stage of three (3) or greater" (Duke 2010l). Declaration of drought stage 3 is based on water levels in Lake Hartwell, which is upstream of Russell Reservoir and water levels in Lake Thurmond, which is downstream of Russell Reservoir. Russell Reservoir is listed as impaired by South Carolina for mercury in fish tissue and the Savannah River downstream of the alternative site location is listed as impaired for mercury, fecal coliform, and turbidity (EPA 2010am).

Building Impacts

Because the building activities at the Middleton Shoals site would be similar to those at the Lee Nuclear Station site, the review team estimated that the water needed for building activities at the Middleton Shoals site would be identical to the proposed amount of water use for building at the Lee Nuclear Station site. Consistent with the Lee Nuclear Station, the review team assumed that groundwater would not be used. During building activities at the Lee Nuclear Station site, the average estimated water use is projected to be 250,000 gpd or 0.39 cfs (Table 3-5). The review team assumed that surface water from Russell Reservoir would be used at the Middleton Shoals site for potable and sanitary use as well as for various building-related activities. This water-use rate is inconsequential when compared to the volume of Russell Reservoir. The review team assumed that building activities could cease, if needed, during drought emergency conditions without any significant overall impact on schedule. Because the surface-water withdrawal would be minor compared to the reservoir volume and because the withdrawal from the reservoir would be temporary and limited to the building period, the review team concludes that the impact of surface-water use for building the potential units at the Middleton Shoals site would be minimal.

Duke stated that it would need to develop a cooling-water reservoir at the Middleton Shoals site to support station operations. Historically, Lake Hartwell and Lake Thurmond have been in a Stage 3 drought designation for up to 158 days (Duke 2010l). Development of two nuclear units at the Middleton Shoals site would require building an additional reservoir with a storage capacity of 115,000 ac-ft to provide cooling water for plant operations during droughts. Cooling water would be supplied from Russell Reservoir (Duke 2009c). Duke would alter the drainage of a tributary creek to the Savannah River to create the storage volume needed to supply cooling water during future droughts of the magnitude experienced in the historical worst-case drought (Duke 2010l). Because a single creek would be affected and the drainage area is small relative to the area of the Savannah River Basin, changes to flow in the Savannah River system as a result of building the reservoir would not be detectable.

As stated above, the review team assumed that no groundwater would be used to build the units at the Middleton Shoals site. The review team also assumed that the impact of dewatering the excavations needed for building two units at the site would be temporary and minor at the Middleton Shoals site because technology (e.g., slurry walls and grouting) is readily available to control water inflow to the excavation if needed. Therefore, because there would be no groundwater use and the impact of dewatering would be temporary and minor, the review team determined that there would be minimal impact on groundwater resources.

Surface-water quality could be affected by stormwater runoff during site preparation and the building of the facilities. The SCDHEC would require Duke to develop an SWPPP. The SWPPP would identify BMPs to control the impacts of stormwater runoff. The review team anticipates that Duke would construct new detention and infiltration ponds and drainage ditches to control delivery of sediment from the disturbed area to nearby waterbodies. Sediment carried with stormwater from the disturbed area would settle in the detention ponds and the stormwater would infiltrate into the shallow aquifer. As a result, stormwater runoff is not anticipated to affect water quality in the Russell Reservoir. Therefore, during building activities, the surface-water-quality impacts near the Middleton Shoals site would be temporary and minimal.

While building new nuclear units at the Middleton Shoals site, impacts on groundwater quality may occur from leaching of spilled effluents into the subsurface. The review team assumes that the BMPs Duke has proposed for the Lee Nuclear Station site would also be in place during building activities at the Middleton Shoals site, and therefore the review team concludes that any spills would be quickly detected and remediated. As discussed in Section 4.2.3.1, the development of an SWPPP with its call for implementation of BMPs would minimize water-quality impacts. Because any spills related to building activities would be quickly remediated under BMPs, and the activities would be temporary, the review team concludes that the groundwater-quality impacts from building at the Middleton Shoals site would be minimal.

Operational Impacts

The review team assumed that the cooling-water system for the proposed plant, if built and operated at the Middleton Shoals site, would be similar to that proposed at the Lee Nuclear Station site; specifically, the cooling-water system would withdraw water from Russell Reservoir, use cooling towers, and blowdown would be discharged back to Russell Reservoir.

Duke proposes a new reservoir with a storage capacity of 115,000 ac-ft at the Middleton Shoals site would provide supplemental water when adequate water from Russell Reservoir may not be available (Duke 2010l). Duke did not provide details of the cooling-water intake and effluent discharge locations. However, it is standard practice for power plants to design cooling-water intake and effluent discharge locations such that recirculation of discharged effluent to the intake does not occur.

Duke determined that the total amount of water required to operate two units would be approximately 35,000 gpm (78 cfs). About 2000 gpm (4.5 cfs) would be used for the screen wash system and thus return to the river at the intake location. As indicated for the Lee Nuclear Station in Chapter 3, consumptive losses through evaporation and drift from cooling two units would be approximately 24,700 gpm (55 cfs) (Duke 2009c). The remaining 18 cfs would be returned via pipeline to the lake at the discharge location.

The source of water for this site would be from Russell Reservoir, which would support the 55 cfs consumptive withdrawal for the new units. A 115,000 ac-ft supplemental water reservoir would need to be built to supply water during low water availability periods. When water levels in Lake Hartwell and Thurmond Lake drop below drought stage 3 levels, water from a supplemental water-storage reservoir would be required or operation of the plant would need to be curtailed. The proposed 115,000 ac-ft reservoir would allow the plant to operate for 158 days without relying on Russell Reservoir (Duke 2010l). Based on the small fraction of available water that would be used during normal conditions and the availability of the proposed water-storage reservoir for use during low water availability periods, the review team determined that the operational impact of the proposed plant at the Middleton Shoals site on surface water would be minimal. Similar to the Lee Nuclear Station, the reservoir refill rate was assumed to be 200 cfs. This would be limited based on current reservoir conditions and would only be used after the reservoir had been drawn down to provide water for plant operation during drought periods.

As stated above, the review team assumed that no groundwater would be used to operate the units at the Middleton Shoals site. Therefore, because there would be no groundwater use, the review team determined that there would be no impact on groundwater resources.

During the operation of the proposed plant at the Middleton Shoals site, impacts on surface-water quality could result from stormwater runoff, discharges of treated sanitary and other wastewater, and blowdown from cooling towers into the Russell Reservoir. The review team assumed that the blowdown rate would be the same as that at the Lee Nuclear Station site, 8216 gpm (18 cfs). Blowdown would be regulated by SCDHEC pursuant to 40 CFR Part 423 and all discharges would be required to comply with limits established by SCDHEC in an NPDES permit.

The SCDHEC would require Duke to develop an SWPPP. The plan would identify measures to be used to control stormwater runoff. Because stormwater controls would be in place and blowdown discharges would be regulated under an NPDES permit, the review team concludes that the impacts on surface-water quality from operation of two nuclear units at the Middleton Shoals site would be minimal.

During the operation of new nuclear units at the Middleton Shoals site, impacts on groundwater quality could result from potential spills. Spills that might affect the quality of groundwater would be prevented or remediated by using BMPs. Because BMPs would be used to quickly remediate spills and no intentional discharge to groundwater should occur, the review team concludes that the impacts on groundwater quality from operation of two nuclear units at the Middleton Shoals site would be minimal.

Cumulative Impacts

In addition to water-use and water-quality impacts from building and operations activities, cumulative impacts analysis considers other past, present, and reasonably foreseeable future actions that affect the same environmental resources. For the cumulative analysis of impacts on surface water, the geographic area of interest for this alternative site is considered to be the drainage basin of Savannah River upstream and downstream of the site because it is the resource that would be affected by the proposed project.

Key actions that have past, present, and future potential impacts on surface-water supply and surface-water quality in this drainage basin include the operation of the Russell Dam that forms Russell Lake and other dams and reservoirs upstream and downstream of the Middleton Shoals site. Upstream is Lake Hartwell created by Hartwell Dam and Lake Keowee created by dams on the Keowee River (Keowee Dam) and on the Little River (Little River Dam). Upstream of Lake Keowee is the Jocassee Hydroelectric Station, a 610-MW pumped-storage facility that creates Lake Jocassee. Downstream of the site is Thurmond Lake and Thurmond Dam. These dams increase the reliability of water supply to the region and to provide power.

The Oconee Nuclear Station, which includes three 846-MW units and is located upstream on Lake Keowee, has past, present, and future impacts on water quality and water supply in the region because it uses Lake Keowee as a source of cooling water. Additional actions that have past, present, and future potential impacts on water supply and water quality in the Savannah River Basin include operating SCE&G's Urquhart Station (a fossil-fueled electrical generating plant) (SCE&G 2009a), operating and decommissioning DOE facilities at the SRS, operating two existing nuclear power plants at the Vogtle site, building and operating two new power plants at the Vogtle site (NRC 2008h), and other municipal and industrial activities in the Savannah River Basin.

The GCRP has compiled the state of knowledge in climate change (GCRP 2009). This compilation has been considered in the preparation of this EIS. The projections for changes in temperature, precipitation, droughts, and increasing reliance on aquifers within the Savannah River Basin are similar to those at other alternative sites in the region. These regional changes are discussed in Section 7.2 of this EIS.

Cumulative Water Use

Based on a review of the GCRP assessment of the Southeast United States region, the review team conservatively estimated a decrease in streamflow of 10 percent over the life of the station. This reduction in streamflow will result in a higher incidence of times when water levels in Lake Hartwell and Lake Thurmond drop below drought stage 3 levels and use of the supplemental reservoir would be needed. The review team also considered the increased water demands associated with an increased population in the region. The SCDNR indicates that "water demand for industry, public supply, crop and golf course irrigation, and domestic use is expected to increase by nearly 50 percent between the years 2000 and 2045" (SCDNR 2004).

By considering the impact of climate change on historical flows and allowing for continued increase in water demand due to population growth in the region, the review team determined that the reservoir would be needed more frequently as time goes on and, in some instances, the plant would exhaust its water supply and the units might be required to derate or cease operation.

The impacts of the other projects listed in Table 9-14 are considered in the analysis included above or would have little or no impact on surface-water use. The projects believed to have little impact are excluded from the analysis either because they are too distant from the Middleton Shoals site, use relatively little or no surface water, or have little or no discharge to surface water. Some projects (e.g., park and forest management) are ongoing, and changes in their operations that would have large impacts on surface-water use appear unlikely.

The review team determined that the cumulative impacts on water supply associated with operation of the proposed units, other water users, climate change, and population growth would be MODERATE, but the incremental impact associated with water use for the Middleton Shoals site was determined not to be a significant contributor to the MODERATE impact.

As stated above, the review team assumed that no groundwater would be used to build or operate the units at the Middleton Shoals site and that groundwater impacts from dewatering would be temporary and minor. Therefore, the review team determined that the Middleton Shoals site by itself would have minimal impact on groundwater resources.

Other projects listed in Table 9-14 are, for the most part, 7 or more miles away from the Middleton Shoals site and so will not contribute to a cumulative impact on groundwater supply. Because groundwater-use impacts are limited and temporary due to aquifer dewatering during the building phase, and other projects are not anticipated near the Middleton Shoals site, the review team concludes that cumulative impacts on groundwater use at the alternative site would be SMALL.

Cumulative Water Quality

Point and nonpoint sources have affected the water quality of the Savannah River upstream and downstream of the Middleton Shoals site. The Savannah River appears on South Carolina's list of impaired waters for a variety of parameters including the presence of mercury in fish tissue (SCDHEC 2011c); Russell Reservoir appears on the list for the presence of mercury and polychlorinated biphenyls in fish tissue. The impacts of other projects listed in Table 9-14 are either considered in the analysis included above or would have little or no impact on surface-water quality. Therefore, the review team concludes that the cumulative impact on surface-water quality of the receiving waterbody would be MODERATE. Water-quality information presented above for the impacts of building and operating the proposed new units at the Middleton Shoals site would also apply to evaluation of cumulative impacts. As mentioned above, the State of South Carolina requires an applicant to develop an SWPPP. The plan would identify measures to be used to control stormwater runoff. The blowdown would be regulated by EPA pursuant to 40 CFR Part 423 and all discharges would be required to comply with limits established by the SCDHEC in an NPDES permit. Such permits are designed to protect water quality. Therefore, because industrial and wastewater discharges from the proposed units would comply with NPDES permit limitations and any stormwater runoff from the site during operations would comply with the SWPPP, the review team concludes that building and operating the proposed units at the Middleton Shoals site would not be a significant contributor to cumulative impacts on surface-water quality.

Other projects listed in Table 9-14 are, for the most part, 7 or more miles away from the Middleton Shoals site and so would not contribute to a cumulative impact on groundwater quality in the ROI. The review team also concludes that with the implementation of BMPs, the cumulative impacts of groundwater quality from building and operating two new nuclear units at the Middleton Shoals site would likely be minimal. Therefore, the cumulative impact on groundwater quality would be SMALL.

9.3.5.3 Terrestrial and Wetland Resources

The following analysis includes impacts from building and operating the proposed new facilities on terrestrial ecology resources at the Middleton Shoals site. The analysis also considers past, present, and reasonably foreseeable future actions that affect the terrestrial ecological resources, including other Federal and non-Federal projects and the projects listed in Table 9-14. For the analysis of terrestrial ecological impacts at the Middleton Shoals site, the geographic area of interest includes portions of Anderson and Abbeville Counties, South Carolina, and portions of Elbert and Hart Counties, Georgia, that are within a 15-mi radius of the Middleton Shoals site. This area encompasses the supplemental cooling-water reservoir and all the ancillary facilities (one transmission line, a cooling-water pipeline, a railroad spur, and a road alignment), and the important animal and plant species and communities that could be potentially affected. The 15-mi distance was used by the SCDNR for its species and community of concern occurrence analysis. Because the 15-mi distance encompassed roughly two-thirds of the land area of the affected counties in Georgia, county-wide records of species and communities from the Georgia Department of Natural Resources (GDNR) were also used.

In developing this EIS, the review team relied upon reconnaissance-level information to perform the alternative site evaluation in accordance with ESRP 9.3 (NRC 2000a). Reconnaissance-level information is data that are readily available from agencies and other public sources such as scientific literature, books, and Internet websites. It also can include information obtained through site visits. To identify terrestrial resources at the Middleton Shoals site, the review team relied primarily on the following information:

- A tour of the Middleton Shoals alternative site in April 2008 (NRC 2008d) and a tour of the Middleton Shoals site and reservoir site in August 2010 (NRC 2010c)
- Lee Nuclear Station COL ER and supplement (Duke 2009b, c)
- Lee Nuclear Station Joint Application for Activities Affecting Waters of the United States submitted by Duke (2011h) to the USACE

- responses to RAIs provided by Duke (2010f, g)
- FWS Endangered Species Program database for South Carolina (FWS 2012a) and Georgia (FWS 2012c), and South Carolina (SCDNR 2012n, p) and Georgia (GDNR 2011a) Natural Heritage Program county record searches
- correspondence regarding species occurrence from the SCDNR (SCDNR 2012b).

Site Description

The Middleton Shoals site is situated within the Piedmont ecoregion in South Carolina (Griffith et al. 2002). As described in Section 7.3.1, the Piedmont ecoregion has been altered to a great extent since European settlement, primarily because of farming, agriculture, and silviculture. National Land Cover Data based on 2006 imagery (MRLC 2011) indicate that land cover within a 15-mi radius of the Middleton Shoals plant site consists of forest (approximately 48 percent), including deciduous forest (approximately 29 percent), evergreen forest (approximately 18 percent), and mixed forest (approximately 1 percent); early succession shrub/scrub and grassland/herbaceous cover (approximately 11 percent); wetlands (mostly woody) (approximately 2 percent); agriculture (pasture and cultivated crops) (approximately 22 percent); developed land (approximately 8 percent); and open water (approximately 9 percent). Forest habitat is highly fragmented, and much of it occurs in the area surrounding Lake Russell.

Duke provided a description of the vegetation cover types within a 2500-ft radius of the center of the Middleton Shoals site, covering about 450 ac. Cover types consist of pine/mixed hardwood (144 ac), upland scrub (104 ac), mixed hardwood (99 ac), pine (58 ac), mixed hardwood/pine (21 ac), open/field/meadow (13 ac), open water (11 ac), and wetlands (1.2 ac) (Duke 2009b, 2010f). Hardwood and mixed hardwood forest, which provide higher quality habitat to wildlife than pine or open/field/meadow, comprise 264 ac or about 60 percent of the Middleton Shoals site. As described in Section 9.3.5.1, operation of new facilities at the Middleton Shoals site would require one offsite supplemental cooling-water reservoir and ancillary facilities consisting of a railroad spur, a transmission line, a cooling-water pipeline, and a road realignment.

The staff visited the Middleton Shoals site in April 2008 (NRC 2008d) and the Middleton Shoals site and the site of the cooling-water reservoir in August 2010 (NRC 2010c). The presumed power block area consists mostly of mature pine forest with a hardwood understory that is being actively managed, as evidenced by recent thinning. The cooling reservoir watershed consists of an approximately 40-yr-old hardwood forest riparian corridor surrounded by managed pine forests interspersed with agricultural fields. The reservoir site watershed is characteristic of small stream watersheds in the Piedmont ecoregion.

Federally Listed and State-Ranked Species

Duke provided no field survey information for the Middleton Shoals site. The review team is not aware of any biological field surveys of the area of the Middleton Shoals site, or the site of the cooling-water reservoir, the transmission-line corridor, water-pipeline corridor, railroad corridor, or road realignment.

The presence/absence of Federally listed and State-ranked species in the project footprint cannot be ascertained without site-specific field surveys. However, a query of the South Carolina rare, threatened, and endangered species inventory database (SCDNR 2012b) and county-wide records from the Georgia rare species and natural community database (GDNR 2011a) identified 24 plant and animal species that are either Federally listed as endangered or are ranked by the States of South Carolina and Georgia as critically imperiled, imperiled, or vulnerable (Table 9-16) in Anderson and Abbeville Counties, South Carolina, and Elbert and Hart Counties, Georgia. One of the State-ranked animal species in South Carolina and Georgia (bald eagle) and some of the State-ranked plant species in Georgia also have been assigned a State protection status as threatened or endangered (Table 9-16). The State ranking (in addition to the Federal listing) provides a common basis for comparing important animal and plant species among the Lee, Perkins, Keowee, and Middleton Shoals sites.

Of the 24 taxa documented in Table 9-16, one is Federally listed as endangered, Michaux's sumac. Michaux's sumac occurs in sandy or rocky open woods, usually on ridges with a disturbance history (periodic fire, prior agricultural use, maintained transmission right-of-way). Michaux's sumac is presumed to be extirpated in South Carolina (Table 9-16), and the only confirmed extant population in naturally-functioning habitat in Georgia is located in Elbert County (FWS 2013), which is across the Savannah River from the Middleton Shoals site. This species is not known to occur within or near the Middleton Shoals site or the site of the cooling-water reservoir. However, as noted above, open field, early successional habitat is present within the geographic area of interest and on the Middleton Shoals site. Therefore, suitable habitat for this species could be present on the Middleton Shoals site and the site of the cooling-water reservoir and ancillary facilities.

Two State-ranked plant species, pale yellow trillium (*Trillium discolor*) and southern adder's tongue fern (*Ophioglossum vulgatum* [=*O. pusillum*]), have been documented within the vicinity of the railroad spur (Duke 2010g). Pale yellow trillium occurs in rich cove forests and is restricted to the Savannah River drainage (Weakley 2010). It is not known from Anderson or Abbeville Counties, South Carolina, but is known from Elbert and Hart Counties, Georgia, where it is considered to be critically imperiled (Table 9-16). Southern adder's tongue fern occurs in moist streamside meadows (Weakley 2010), and of the four counties in the geographic area of interest, it is known to occur only in Abbeville County, South Carolina. The species is considered imperiled in South Carolina (Table 9-16).

Table 9-16. Terrestrial Federally Listed Species and State-Ranked Species within 15 mi of the Middleton Shoals Site in Anderson and Abbeville Counties, South Carolina, and County-Wide Across Elbert and Hart Counties, Georgia

Scientific Name	Common Name	Federal Status[a]	SC State Rank/ Protection Status[b]	GA State Rank/ Protection Status[b]	Counties of Occurrence	Habitat[c]
Mammals						
Sylvilagus aquaticus	swamp rabbit	-	S2	NA	Anderson	mature forests in floodplains, bottomlands, riparian areas
Birds						
Haliaeetus leucocephalus	bald eagle	BGEPA	S2/ST	S2/T	Abbeville, Anderson, Hart	major rivers, large lakes, reservoirs[d]
Tyto alba	barn owl	-	S4	S3	Hart	nests in buildings, caves, crevices on cliffs, burrows, and hollow trees
Plants						
Clematis ochroleuca	curly-heads	-	NA	S2	Elbert	dry woodlands and woodland borders
Collinsonia verticillata	whorled horse-balm	-	S3	NA	Abbeville, Anderson	rich moist (cove) forests to dry oak forests
Juniperus communis var. *depressa*	ground juniper	-	SNR	S1	Elbert	in thin soil around rock outcrops on mountain summits and Piedmont monadnocks and rocky bluffs
Lithospermum tuberosum	tuberous gromwell	-	S1	NA	Abbeville	nutrient-rich forests

Table 9-16. (contd)

Scientific Name	Common Name	Federal Status[a]	SC State Rank/ Protection Status[b]	GA State Rank/ Protection Status[b]	Counties of Occurrence	Habitat[c]
Lotus helleri (=Acmispon helleri)	Carolina trefoil	-	NA	S1/E	Elbert	dry woodlands and openings, originally probably prairie-like sites, now along roadbanks, railroads, powerline rights-of-way
Lysimachia fraseri	Fraser's loosestrife	-	S3	NA	Anderson	hardwood forests, forest edges and roadbanks, thin soils around rock outcrops
Monotropsis odorata	sweet pinesap	-	S2	S1/T	Elbert	dry to mesic upland woods under oaks and/or pines
Ophioglossum vulgatum (= *O. pusillum*)	southern adder's-tongue fern	-	S2	NA	Abbeville	moist streamside meadows
Pachysandra procumbens	Allegheny-spurge	-	S2	S1	Abbeville	moist rich woods
Platanthera lacera	green-fringe orchis	-	S2	NA	Abbeville, Anderson	swamps, bogs, seepages
Quercus oglethorpensis	Oglethorpe oak	-	S3	S2/T	Elbert	bottomland forests, upland oak flats
Rhus michauxii	Michaux's sumac	E	SX	S1/E	Elbert	sandy or rocky open woods, usually on ridges with a disturbance history (periodic fire, prior agricultural use, maintained right-of-way)[e]

Table 9-16. (contd)

Scientific Name	Common Name	Federal Status[a]	SC State Rank/ Protection Status[b]	GA State Rank/ Protection Status[b]	Counties of Occurrence	Habitat[c]
Sedum pusillum	granite stonecrop	-	S2	S3/T	Elbert	granite outcrops
Scirpus expansus	woodland bulrush	-	NA	S1	Elbert	bogs, marshes, streambeds
Thermopsis fraxinifolia	ash-leaf bush-pea	-	NA	S2	Elbert	dry slopes and ridges
Tradescantia roseolens	rosy spiderwort	-	NA	S2	Elbert, Hart	dry sandy woodlands
Trillium discolor	pale yellow trillium	-	S4	S1	Elbert, Hart	rich cove forests, restricted to the Savannah River drainage
Trillium lancifolium	lanceleaf trillium	-	S1	S3	Elbert	rich forests, floodplain forests
Trillium rugelii	southern nodding trillium	-	S2	NA	Abbeville, Anderson	rich woodlands and forests
Viola tripartita var. *glaberrima*	smooth three-parted violet	-	S1	NA	Abbeville	rich woods[f]
Viola tripartita var. *tripartita*	three-parted violet	-	S3	NA	Abbeville, Anderson	rich woods[f]

Source: Species and Communities Known to Occur Within 15 Miles of Middleton Site October 31, 2012 (SCDNR 2012b) and GDNR (2011a)
(a) Federal status: E = endangered, BGEPA = species not protected under the Endangered Species Act of 1973, as amended, but protected under Bald and Golden Eagle Protection Act (FWS 2012a and FWS 2012c).
(b) State rank: S1 = critically imperiled, S2 = imperiled, S3 = vulnerable, S4 = apparently secure, SNR = unranked, SX = presumed extirpated from the state; State protection status: E = state endangered, ST or T = state threatened; NA = not applicable/species not ranked by the state (SCDNR 2012b, GDNR 2011a).
(c) NatureServe Explorer (2010) for animals and Weakley (2010) for plants, unless otherwise indicated.
(d) 64 FR 36454.
(e) FWS (2012c).
(f) Gleason and Cronquist (1991).

Bald eagles are known to nest along Lake Russell (SCDNR 2010g). Unless a nest occurred on or immediately adjacent to the Middleton Shoals site, or the site of the cooling-water reservoir or ancillary facilities, adverse impacts on the bald eagle would not be likely (FWS 2007).

Building Impacts

Building activities for two nuclear units on the Middleton Shoals site would remove about 265 ac of high-quality wooded habitat (Duke 2010g) and disturb about 1.2 ac of wetlands (Duke 2010g, 2011h). Site preparation for the railroad spur, transmission line, and cooling-water pipeline would remove approximately 170 ac of high-quality wooded habitat (Duke 2010g) and disturb about 4.2 ac of wetlands (Duke 2010g, Duke 2011h). Site preparation and inundation of the supplemental cooling-water reservoir would remove about 1800 ac of high-quality wooded habitat (Duke 2010g) and about 174 ac of wetlands (Duke 2010g, Duke 2011h). Site preparation at the Middleton Shoals site and the ancillary facilities, and site preparation and inundation of the cooling-water reservoir, would affect about 402,000 linear ft (approximately 76 mi) of streams (Duke 2010g, 2011h). The riparian corridors of about 362,000 linear ft (approximately 68 mi) of these streams would be permanently inundated by creation of the reservoir. It is uncertain to what extent riparian corridors would be affected along the other 40,000 linear ft (approximately 8 mi) of streams associated with the Middleton Shoals site and ancillary facilities, because this would depend on the need to clear riparian vegetation (e.g., for transmission-line clearance), and the length of stream that would be so affected has not been determined (Duke 2011h). The overall impact of reservoir development on terrestrial resources would be noticeable and permanent.

Two plant species, one State-ranked as critically imperiled and the other as imperiled, could be affected by development of the Middleton Shoals site and associated facilities (Duke 2010g). Other Federally listed and State-ranked terrestrial species that may be present in the project footprint (Table 9-16) also could be affected. Impacts on wildlife at the Middleton Shoals site would be noticeable and similar to those described for the Lee Nuclear Station site in Section 4.3.1.

Operational Impacts

Impacts on terrestrial ecological resources from operation of two new nuclear units at the Middleton Shoals site would be similar to those for the Lee Nuclear Station site as described in Section 5.3.1. There may be minor differences in operational impacts because of factors such as climate, topography, and elevation.

Cumulative Impacts

Overlaying the historic impacts in the Piedmont ecoregion discussed in the Site Description above are the current projects listed in Table 9-14. Projects located within the geographic area of interest include one hydroelectric facility; two natural-gas facilities; two textile plants; a glassware facility; a hazardous waste facility; an automobile tire manufacturing plant; open pits, quarries, and mines; recreational site improvements; public highway, infrastructure, and community facilities improvements; and broadband access improvement. The development of most of these projects has further reduced, fragmented, and degraded natural forests and wetland and riparian habitat and decreased habitat connectivity. Reasonably foreseeable projects and land uses within the geographic area of interest that would affect terrestrial resources include, ongoing silviculture, farming, and agricultural development, and residential and some limited commercial development.

Summary

Impacts on terrestrial ecology resources are estimated based on the information provided by Duke and the review team's independent review. Site preparation and inundation of the cooling-water reservoir, and site preparation and development of the Middleton Shoals site, new transmission-line corridor, water-pipeline corridor, railroad-spur corridor, and road realignment would affect a total of about 2235 ac of high-quality forest habitat, about 179 ac of wetlands, and about 76 mi of riparian corridor. The overall impact of these activities on habitat and wildlife would be noticeable and permanent, particularly in the watershed containing the reservoir. There are 24 Federally listed or State-ranked terrestrial taxa that potentially occur at the Middleton Shoals site and associated facilities that may be affected. There are past, present, and future activities in the geographic area of interest that have affected and would continue to significantly affect habitat and wildlife in ways similar to site preparation and development for the above facilities (i.e., silviculture, farming, and agricultural development, and residential and some limited commercial development).

The review team concludes that the cumulative impacts from past, present, and reasonably foreseeable future actions, including two new nuclear units at the Middleton Shoals site and associated facilities, on baseline conditions for terrestrial ecological resources in the geographic area of interest would be MODERATE. The incremental contribution to these impacts from building and operating two new nuclear units at the Middleton Shoals site would be significant. The impact could be greater if surveys revealed that Federally listed species are present.

9.3.5.4 Aquatic Resources

The following analysis evaluates the impacts from building and operating the proposed new facilities on aquatic ecology resources at the Middleton Shoals site. The analysis also considers past, present, and reasonably foreseeable future actions that affect the aquatic ecological resources, including other Federal and non-Federal projects and the projects listed in Table 9-14. For the analysis of aquatic ecological impacts at the Middleton Shoals site, the geographic area of interest includes the Savannah River Basin from Hartwell Dam downstream to Russell Dam, including the tributary that would be impounded to create a supplemental water reservoir, and waterbodies crossed by the ancillary facilities (one transmission line, a cooling-water pipeline, and a railroad spur). This geographic region is considered the most likely to show impacts on water quality relative to the water-quality criteria for aquatic biota.

In developing this EIS, the review team relied on reconnaissance-level information to perform the alternative site evaluation in accordance with ESRP 9.3 (NRC 2000a). Reconnaissance-level information is data that are readily available from agencies and other public sources such as scientific literature, books, and Internet websites. It can also include information obtained through site visits. To identify aquatic resources at the Middleton Shoals site, the review team relied primarily on the following information:

- a tour of the Middleton Shoals alternative site in April 2008 (NRC 2008d) and a tour of the Middleton Shoals alternative site and supplemental cooling-water reservoir site in August 2010 (NRC 2010c)
- Lee Nuclear Station Joint Application for Activities Affecting Waters of the United States submitted by Duke (2011h) to the USACE
- responses to RAIs provided by Duke (2010g, 2010l)
- FWS Endangered Species Program database for South Carolina (FWS 2012a) and Georgia (FWS 2012c), and South Carolina (SCDNR 2012n, p) and Georgia (GDNR 2011a) Natural Heritage Program county record searches
- correspondence regarding species occurrence from the SCDNR (SCDNR 2012b).

Site Description

The Middleton Shoals site is a wooded greenfield site located on Lake Russell in Anderson County, South Carolina. The site would be located next to Lake Russell approximately 8 mi downstream from Hartwell Dam where the water still has riverine (as opposed to reservoir-like) properties.

The staff visited the Middleton Shoals site in 2008 (NRC 2008d) and the site of the supplemental cooling-water reservoir in 2010 (NRC 2010c). The typical Savannah River shoreline near the proposed location of the cooling-water intake was lined with trees. Banks were generally steep and showed signs of erosion. The tributary that would be impounded to create a supplemental cooling-water reservoir appeared to be wide and turbid, with vegetated sandbars. It was lined with overhanging riparian vegetation, and the surrounding area was forested. The supplemental cooling-water reservoir site watershed is characteristic of small stream watersheds in the Piedmont ecoregion.

Recreationally Important Species

Some of the common sport fish in Lake Russell include Striped Bass, Largemouth Bass, Spotted Bass, Bluegill, Redear Sunfish, and crappie. These fish are common to the Piedmont ecoregion of South Carolina.

Non-Native and Nuisance Species

The Spotted Bass and Asiatic clam (*Corbicula fluminea*) are non-native species found in the Savannah River Basin. Spotted Bass are not native to South Carolina, but have been illegally introduced by anglers into Jocassee, Keowee, Hartwell, and Russell Lakes, where they are a popular sport fish. They may competitively displace Largemouth Bass and appear to be degrading native Redeye Bass (*Micropterus coosae*) populations through competition and hybridization (SCDNR 2008a). Spotted Bass also are correlated with declines in crappie fisheries in some areas.

Federally Listed and State-Ranked Species

Duke provided no field survey information for the Middleton Shoals site. The review team is not aware of any biological field surveys of the area of the Middleton Shoals site, or the site of the cooling-water reservoir, the transmission-line corridor, water-pipeline corridor, or railroad-spur corridor. The presence/absence of Federally listed and State-ranked species in the project footprint cannot be ascertained without site-specific field surveys.

A recent review of the Federally listed and State-ranked aquatic species that may occur in Abbeville and Anderson Counties in South Carolina and in Elbert and Hart Counties in Georgia, near the Middleton Shoals site was performed by the review team. The only Federally listed aquatic species identified was the endangered Carolina heelsplitter (*Lasmigona decorata*), a freshwater mussel. It is listed by FWS as possibly occurring in Abbeville County (FWS 2012a) (Table 9-17).

Eel-grass is the only State-ranked aquatic species (S1– imperiled, Anderson County) listed in Table 9-17 that has been positively identified as occurring within 15 mi of the Middleton Shoals site (SCDNR 2012b). There are two State-protected species within the geographic area of interest: the Carolina heelsplitter (Abbeville County) and the Carolina Darter (Anderson County); they have an assigned State protection status of endangered and threatened, respectively (SCDNR 2012p, n). Georgia State-ranked species with occurrence in Elbert County include two fish, the State-endangered Robust Redhorse and the State-rare Sandbar Shiner (*Notropis scepticus*); two State-threatened crayfish, the lean crayfish (*Cambarus strigosus*) and the Broad River burrowing crayfish (*Distocambarus devexus*), and one freshwater snail, the Savannah pebblesnail (*Somatogyrus tenax*). The Sandbar Shiner also occurs in Hart County (GDNR 2011a). The State ranking (in addition to the Federal listing) provides the only common basis for comparison of numbers of important aquatic species among the Lee, Perkins, Keowee, and Middleton Shoals sites. The Federally listed, State-protected, or State-ranked S1 species are described in more detail below.

Table 9-17. Aquatic Federally Listed and State-Ranked Species in Anderson and Abbeville Counties, South Carolina, and in Elbert and Hart Counties, Georgia

Scientific Name	Common Name	Federal Status[(a)]	SC State Rank/Protection Status[(b)]	GA State Rank/Protection Status[(b)]	Counties of Occurrence
Fish					
Etheostoma collis	Carolina Darter	-	-/T	-	Anderson
Moxostoma robustum	Robust Redhorse	-	-	S1/E	Elbert
Notropis scepticus	Sandbar Shiner	-	-	S2/R	Elbert, Hart
Mollusks					
Lasmigona decorata	Carolina heelsplitter	E	S1/E	-	Abbeville
Somatogyrus tenax	Savannah pebblesnail	-	-	S2S3/-	Elbert
Crustaceans					
Cambarus strigosus	lean crayfish	-	-	S2/T	Elbert
Distocambarus devexus	Broad River burrowing crayfish	-	-	S1/T	Elbert
Aquatic Plant					
Vallisneria americana	eel-grass		S1	-	Anderson

(a) Federal status: E = endangered (FWS 2012a, c).
(b) State rank: S1 = critically imperiled, S2 = imperiled; S3 = vulnerable, S#S# = a numeric range rank used to indicate uncertainty about the exact status of the element; State protection status: E = endangered, T = threatened, R = rare: not listed, but deserving of protection (SCDNR 2012n, p; GDNR 2011a); NatureServe Explorer 2012d).

Carolina Darter

The Carolina Darter in South Carolina is reported in the Yadkin, Pee Dee, and Catawba River drainages but not in the Savannah River Basin (SCDNR 2005). Occurrences are rare, and it is not known whether the species is holding steady or is in decline. The Carolina Darter inhabits small- to moderate-sized streams with low current velocities. It is found most often in habitats with mud or sand substrates, but also has been observed over bedrock. It is not considered stable anywhere within its relatively small range, which extends only from south-central Virginia to north-central South Carolina. Because it has not been recorded in the Savannah River Basin, it is unlikely to be affected by building or operating a nuclear power station at the Middleton Shoals site.

Robust Redhorse

The Robust Redhorse is ranked S1, critically imperiled, in Georgia and is designated as a species of highest conservation priority in South Carolina (SCDNR 2005). It has been found in the Lower Oconee and Middle Savannah Rivers inside the geographic area of interest (Straight et al. 2009). Wild populations exist in this region and successful stocking of the Robust Redhorse in other watersheds has helped to re-establish historical populations. The fish can be difficult to sample because it prefers deep, moderately swift areas near woody debris. Reduced habitat quality and quantity are threats to the species that could potentially be exacerbated through building and operating a new Middleton Shoals nuclear facility and reservoir.

Carolina Heelsplitter

The Federally and South Carolina State-endangered Carolina heelsplitter has been recorded historically from the Savannah River Basin in South Carolina (Bogan and Alderman 2008); little is known about its current status. In South Carolina this species is ranked S1, critically imperiled, and is classified as a species of highest conservation priority by the SCDNR (SCDNR 2005). It has been reported from a wide range of habitats, including creeks, streams, rivers, and ponds. Substrates may include soft mud, sand, muddy sand, and sandy gravel. While it is unlikely the Carolina heelsplitter would be found in the vicinity of the Middleton Shoals site, it is not impossible. If the species is present in the reservoir near the proposed site or on the tributary Duke intends to dam, the species could be significantly and negatively affected. Surveys designed to search for the mussel would need to be conducted to rule out its presence.

Lean Crayfish

The lean crayfish, State-threatened and State-ranked (S2, imperiled) in Georgia, burrows next to streams or in low areas where the water table is near the ground surface. It is known from about 10 locations in the Broad River and Little River systems (Savannah River drainage) in northeast Georgia, including Elbert County (GDNR 2011b). The Little River is a tributary that flows into the J. Strom Thurmond Reservoir. The limited range of the lean crayfish makes it vulnerable to activities that disturb lands near streams and wetlands. While slightly downstream and outside the geographic area of interest, surveys for lean crayfish would be required to determine the species' presence or absence.

Broad River Burrowing Crayfish

The Broad River burrowing crayfish, State-threatened and State-ranked (S1, critically imperiled) in Georgia, also makes burrows next to streams or in low areas where the water table is near the ground surface. They have been captured in temporary pools and ephemeral streams. The species is known only from about seven locations in the Broad River system (Savannah River drainage) in northeastern Georgia, including Elbert County (GDNR 2011b). This system flows into the J. Strom Thurmond Reservoir. The limited range of the Broad River makes it vulnerable to activities that disturb lands near streams and wetlands. While slightly downstream and outside the geographic area of interest, surveys for Broad River burrowing crayfish would be required to determine the species' presence or absence.

Eel-Grass

A member of the tape-grass family (Hydrocharitaceae), eel-grass is found in tidal freshwater marsh where the average annual salinity is less than 0.5 parts per thousand, as well as in clear lakes and in flowing waters of clear streams and small rivers (Nelson 1986; USACE 2012c). Not a true grass, it is a native submerged aquatic vegetation species distributed across much of the United States. The plants are considered a beneficial food source for waterfowl and are sometimes planted for wildlife and fish habitat (USACE 2012c). However, large colonies sometimes interfere with boating and fishing because the long, ribbon-like leaves can reach 3 ft in length and can fill narrow or shallow waterways (USACE 2012c). Eel-grass is State-ranked (S1, critically imperiled) in South Carolina and has been documented in Anderson County within 15 mi of the Middleton Shoals site (SCDNR 2012b). Efforts to establish additional native eel-grass plants to combat the spread of non-native species such as *Hydrilla* have been undertaken in some parts of the State (SCDNR 2012q).

Critical Habitats

No critical habitat has been designated by FWS or NMFS in the vicinity of the Middleton Shoals site.

Building Impacts

Building impacts would likely include impacts on water quality from direct (e.g., dredging, shoreline excavation, clearing, impoundment, etc.) and indirect (e.g., stormwater runoff, sedimentation, etc.) sources. Two new reactor units at the site would require cooling-water intake and discharge systems. A cooling-water intake would be sited near the station and water would be withdrawn from Lake Russell. In addition, Duke would dam a small tributary of the Savannah River to create a supplemental water supply for use during low-flow events. Blowdown would be discharged to Lake Russell. Operation of new facilities at the Middleton Shoals site would require a supplemental cooling-water reservoir (3700 ac [Duke 2010g] with approximately 115,000 ac-ft of storage [Duke 2010l]) and ancillary facilities consisting of a railroad spur, transmission line, cooling-water pipeline (Duke 2010g). The new reactor site, reservoir, and ancillary facilities would affect the creek system and its inhabitants, estimated to beabout402,000 linear ft (approximately 76 mi), which includes the conversion of 362,000 linear ft of stream from a lotic to lentic environment for the supplemental cooling-water reservoir (Duke 2010g). Building activities would also affect a total of 56 ac of open water (7 ac associated with the site, 30 ac associated with the reservoir, and 19 ac associated with ancillary features) (Duke 2011h).

Duke indicated during the April 2008 site visit that one water inlet between two “fingers” of land on the east bank of the Savannah River would be filled to provide a level surface for the station. No areal estimates were provided, but this filling and the resulting loss of aquatic habitat would be sufficient to alter noticeably, but not likely destabilize, important aspects of the resources. All benthic organisms in that area would be lost.

As discussed in Section 9.3.5.1, a new transmission-line corridor would be required to connect the site to the existing transmission-line system. A railroad spur would also be installed to transport building materials to the site. Impacts on aquatic resources from transmission line and railroad-spur installation would be similar to those described for the proposed Lee Nuclear Station in Section 4.3.2.

Operational Impacts

Because a closed-cycle cooling system and supplemental cooling-water reservoir are proposed for the Middleton Shoals site, operational impacts would be expected to be similar to those for the proposed Lee Nuclear Station site as described in Section 5.3.2.

Cumulative Impacts

Current actions in the vicinity that have present and future potential impacts on aquatic ecological resources include operation of energy-production facilities, discharge of water by domestic and industrial NPDES permit holders, withdrawal of water for domestic and industrial purposes, sand and gravel mining, the existence of nature preserves, and ongoing urbanization of the area. They are described in Table 9-14.

The USACE developed Lake Hartwell, Lake Russell, and the associated Hartwell Dam and Richard B. Russell Dam as multipurpose projects. The reservoirs and hydropower generating stations have greatly modified aquatic habitat in the region and will continue to affect aquatic resources while they are operational (USACE 2011b).

Federal regulations prohibit private use of public lands surrounding Lake Russell. At least a 300-ft-wide buffer of public land surrounds the lake. Private shoreline development is not allowed, so Lake Russell has an undeveloped shoreline that provides abundant wildlife habitat (USACE 2011b). Several parks and recreation areas are located within the geographic area of interest, including the 2500-ac Richard B. Russell State Park at the north end of Lake Russell, approximately 5 mi downstream from the Middleton Shoals site, and the 316-ac Calhoun Falls State Recreation Area approximately 12 mi south of the Middleton Shoals site on the easternmost arm of Lake Russell. Other recreation areas 15 to 20 mi downstream of the Middleton Shoals site include the Hart State Outdoor Recreation Area and Bobby Brown Outdoor Recreation Area. These managed areas serve to preserve shoreline habitat and, thereby, limit the potential for future urbanization in those areas.

Reasonably foreseeable projects and water uses within the geographic area of interest that would affect aquatic resources include continued operation of and potential improvements to hydropower generating facilities, discharge of water by domestic and industrial NPDES permit holders, withdrawal of water for domestic and industrial purposes, sand and gravel mining, farming and agricultural development, and residential and possibly some limited commercial development.

Summary

Impacts on aquatic ecology resources are estimated based on the information provided by Duke and the review team's independent review. The most noticeable building activities would affect approximately 402,000 linear ft (approximately 76 mi) of stream habitat and the associated aquatic species. The impacts of building two new nuclear units and a new reservoir on the aquatic ecology of the Savannah River (including Lake Russell) and its tributaries would be clearly noticeable.

There is one Federally and State-listed aquatic endangered species and seven State-ranked or State-listed aquatic species that potentially occur at the Middleton Shoals site and associated facilities that may be affected. Of these species, eel-grass is the only species positively identified as occurring within 15 mi of the Middleton Shoals site (SCDNR 2012b). Surveys to determine the presence or absence of Federally listed and State-ranked species have not been performed in the recent past.

There are past, present, and future activities in the geographic area of interest that have affected and would continue to significantly affect aquatic resources in ways similar to the site preparation and development for the above facilities (i.e., surface and groundwater consumption, thermal and chemical discharges to waterbodies, farming and agriculture development, and residential and some limited commercial development).

The review team concludes that the cumulative impacts from past, present, and reasonably foreseeable future actions, including two new nuclear units at the Middleton Shoals site and associated facilities, on baseline conditions for aquatic ecological resources in the geographic area of interest would be MODERATE. The incremental contribution to these impacts from building and operating two new nuclear units at the Middleton Shoals site would be significant. The impact could be greater if surveys reveal that Federally listed species are present.

9.3.5.5 Socioeconomics

For the analysis of socioeconomic impacts at the Middleton Shoals site, the geographic area of interest is considered to be the 50-mi region centered on the Middleton Shoals site with special consideration of the two-county area of Anderson and Pickens Counties, where the review team expects socioeconomic impacts to be the greatest. In evaluating the socioeconomic impacts of building and operations at the Middleton Shoals site in Anderson County, South Carolina, the review team undertook a reconnaissance survey of the region using readily obtainable data from the ER; the alternative site audit; and Federal, State, and local government agencies. The cumulative impacts analysis also considers other past, present, and reasonably foreseeable future actions that affect the same environmental resources, including other Federal and non-Federal projects and the projects listed in Table 9-14.

Socioeconomic impacts span the issues of physical impacts, demography, economic conditions and taxes, and infrastructure and community services. The impacts of building and operating the new units are discussed below.

Physical Impacts

Many physical impacts of building and operation would be similar regardless of the site. Building activities can cause temporary and localized physical impacts such as noise, odor, vehicle exhaust, vibration, shock from blasting, and dust emissions. The use of public roadways, railways, and waterways would be necessary to transport materials and equipment. Offsite areas that would support building activities (e.g., borrow pits, quarries, and disposal sites) would be expected to be already permitted and operational. Offsite activities would include the development of a supplemental reservoir, railroad spur, transmission-line corridor, cooling-water pipeline, and 7 mi of road realignment.

Potential impacts from station operation include noise, odors, exhausts, thermal emissions, and aesthetics. New units would produce noise from the operation of pumps, cooling towers, transformers, turbines, generators, and switchyard equipment. In addition, traffic at the site would be a source of noise. The review team assumed that same standard noise protection and abatement procedures used for the Lee Nuclear Station site would be used to control noise at the Middleton Shoals site. Commuter traffic would be controlled by speed limits. Good road conditions and appropriate speed limits would minimize the noise level generated by the workforce commuting to the Middleton Shoals site.

The new units at the Middleton Shoals site would likely have standby diesel generators and auxiliary power systems. Permits obtained for these generators would ensure that resultant air emissions comply with applicable regulations. In addition, the generators would be operated on a limited, short-term basis. During normal plant operation, new units would not use a significant quantity of chemicals that could generate odors that exceed odor detection threshold values. Good access roads and appropriate speed limits would minimize the dust generated by the commuting workforce.

Transmission lines would need to be constructed, and though they would be sited to avoid residential areas when possible, they would affect residents along the transmission-line corridors. In addition, land would be cleared to build the supplemental reservoir. Due to the amount of land that would be cleared for building the reactors and associated facilities, the review team concludes that the aesthetic impacts of building two units at the Middleton Shoals site would be noticeable but not destabilizing. Aesthetic impacts from operation would be minimal.

Based on the information provided by Duke and the review team's independent evaluation, the review team concludes that the physical impacts of building and operating two new nuclear units at the Middleton Shoals site would be minimal except for a noticeable physical impact on aesthetics during the building phase.

Demography

The Middleton Shoals site is located in Anderson County, South Carolina (population 183,691), south of the town of Anderson (population 26,566). The rest of Anderson County is rural with significant agricultural activities. To the north of Anderson County is Pickens County, South Carolina (population 117,823), which includes the town of Clemson (population 13,596). Also included in the 50-mi region of the Middleton Shoals site are the large metropolitan areas of Greenville, South Carolina (population 57,821); and Athens, Georgia (population 116,714) (USCB 2010e).

Based on the proposed site location, the regional population distribution and U.S. Census Bureau Journey to Work Data (USCB 2000h), the review team expects the in-migrating population would reside in the two-county area of Anderson and Pickens Counties. The review team realizes that workers may choose to live in other counties within the 50-mi region (e.g., Greenville County), but given the small number of workers and the large population base the review team expects impacts to be *de minimis.* Other counties have relatively small populations and are in close proximity to the site; however, these counties do not have the service and retail centers desired by the in-migrating workforce. Therefore, Anderson and Pickens Counties compose the economic impact area and are the focus of the following analysis.

At the peak of the nuclear power station development, Duke expects the workforce onsite to be approximately 4613 workers. Because the Middleton Shoals site is similar to the proposed Lee Nuclear Station site in geography and urbanization, development of the proposed new units on the Middleton Shoals site would have similar socioeconomic impacts in most respects to building the two units on the Lee Nuclear Station site. Based on the analysis of project impacts presented in Section 4.4.2, of the 4613 peak workers approximately 3191 workers would in-migrate into the region with some workers bringing a family for a total in-migrating population of 4516 people. Considering that the maximum estimation of in-migrating population is less than 1 percent of the existing regional population, the review team expects the demographic impacts of building two units on the Middleton Shoals site would be minimal; however, if the in-migrating population were to locate near the plant (e.g., small rural communities near the site), the impact in those communities could be noticeable but temporary. Once the plant is operational, Duke estimates the workforce to be about 957 workers with an estimated

345 migrating into the region, similar to the proposed Lee Nuclear Station site. Based on the information provided by Duke and the review team's independent evaluation, the review team concludes that the demographic impacts of building and operating two new nuclear units at the Middleton Shoals site would be minimal.

Economic Impacts on the Community

Economy

The local labor force is dominated by manufacturing, government, retail trade, and leisure and hospitality. Some of the top manufacturing employers are Electrolux (household refrigerators), Robert Bosch Corporation (oxygen sensors), Michelin North America (semi-finished rubber products), Hexcel Corporation (woven Kevlar fabrics), and Milliken-Cushman (woven filament fabrics). Agriculture represents 38 percent (176,947 ac) of total Anderson County land area (Duke 2009c). Anderson County's 2009 total labor force is 86,031 with an unemployment rate of 12.6 percent. Pickens County's 2009 labor force was 58,194 with an unemployment rate of 10.8 percent. The 2006 unemployment rates for Anderson and Pickens County were 6.7 percent and 6.2, respectively (BLS 2011a). The significant increase in unemployment rates between 2006 and 2009 is attributed to the recent economic downturn afflicting much of the country.

The wages and salaries of the project workforce would have a multiplier effect that would result in increases in business activity, particularly in the retail and service sectors. This multiplier effect would have a positive impact on the business community and could provide opportunities for new businesses and increased employment opportunities for local residents. The review team expects most indirect jobs created in the region would be allocated to residents in the region. Expenditures made by the indirect workforce would also strengthen the regional economy. Because the review team assumes the economic impacts of the Lee Nuclear Station site (in Section 4.4.3.1 and Section 5.4.3.1) also apply to the Middleton Shoals site, the review team concludes the impact of these new indirect jobs would constitute a small percentage of the total number of jobs in Anderson and Pickens Counties and would have a minimal and beneficial economic impact.

Taxes

If the proposed nuclear plant were located at the Middleton Shoals site, Duke would likely enter into a fee-in-lieu of taxes agreement with Anderson County as allowed by South Carolina State law. This agreement would be similar to the one discussed in Section 5.4.3.2. Without a fee-in-lieu agreement, Duke would pay taxes under the governance of South Carolina State law. This agreement would not go into effect until operations at the Middleton Shoals site have commenced. During the building phase, Duke would continue to pay taxes on the land itself. Anderson County property tax revenues in 2012 were $58 million of the County's $86 million total revenues (Anderson County 2012). Based on the agreement Duke has with Cherokee County in regard to the Lee Nuclear Station, which has an assessment value of 2 percent for the fee-in-lieu-of-taxes payments during the first 20 years, Duke estimates Lee Nuclear Station annual payments would be $11.8 million over 40 years of the license period. If Duke entered into a similar agreement for the Middleton Shoals site, the tax payments would increase Anderson County property tax revenues substantially. Total taxes paid during building activities would have a minimal beneficial impact. The total fee-in-lieu-of-tax payment would be expected to be substantial and beneficial during operations in Anderson County and minimal for the rest of the region.

Infrastructure and Community Services

Traffic

SC 187 and SC 184 converge near the site and connect to SC 81 to the east and SC 181 to the north (to Anderson). Those accessing the site would use SC 184 (Duke 2009c). SC 184 from the Georgia line to SC 81 has an average use of 700 vehicles per day and has room for extra capacity (SCDOT 2008). I-85 runs 5 mi north of Anderson and connects it with the Greenville-Spartanburg area. The two-lane roads near the site would need widening. A railroad spur would need to be built for the transport of materials and equipment to the site, and there is residential area near the site (Duke 2009c). An additional 7.0 mi of road would need to be realigned for inundation of the supplemental pond (Duke 2010g). Given the large number of additional vehicles added to the roads during peak construction, the review team expects traffic-related impacts from building the plant at the Middleton Shoals site would be noticeable on roads near the site. The review team expects traffic-related impacts from operations of a nuclear power station on the Middleton Shoals site to be minimal.

Housing

Based on the analysis in Section 4.4.2, approximately 3191 workers would migrate into the region during the peak employment period of the building phase. Later, approximately 345 operations workers would migrate into the region by the time the plant becomes operational. The 2006-2010 ACS estimate for Anderson County indicated a total housing stock of 83,752 units of which 11,779 were vacant. Pickens County had 50,854 housing units of which approximately 6806 were vacant (USCB 2010e). The review team expects that the in-migrating workforce could be absorbed fairly easily into the existing housing stock in the region and the impact would be minimal.

Based on the information provided by Duke and the review team's independent evaluation, the review team concludes that traffic-related and housing impacts of building two new nuclear units at the Middleton Shoals site would be minimal across the region with the exception of noticeable traffic-related impacts on roads near the site. Because of the much lower number of operations-related workers relative to workers during the building phase, the review team determined traffic-related and housing impacts from operations would be minimal.

Recreation

Recreational activities near the Middleton Shoals site revolve mainly around Sadler's Creek State Recreation Area, 10 mi north of the site and Lake Hartwell, which the site is located on. Lake Hartwell is a hub for recreational activity in the area with 962 mi of shoreline and 80 public boat launch, recreation, and park areas (Duke 2009c). One boat launch is immediately south of the site. The supplemental reservoir would not be available for recreation at any of the alternative sites, or the proposed site. Duke has not indicated that recreational activities near the Middleton Shoals site would be limited during building or operation of a nuclear project. Other recreational areas are far enough offsite not to be affected. Therefore, the review expects impacts on recreation would be minimal for both building and operating two new nuclear units at the Middleton Shoals site.

Public Services

The influx of construction workers and plant operations staff settling in the region could affect local municipal water and water-treatment facilities, police, fire, medical, and other social services in the area. Anderson County has two water suppliers for a total of 48 Mgd and a utilization of 20.1 Mgd (Joint Water System 2013). The 11 wastewater-treatment plants in the county have a capacity of 20.02 Mgd and a current utilization of 10.36 Mgd (Upstate Alliance 2009b). An excess capacity in these systems currently exists sufficient to accommodate a new nuclear plant and the in-migration of workers and their families. The impact on public services would depend on the infrastructure that is developed on the site as well as the location in which the in-migrating workforce chooses to live. The in-migrating workers would represent a small portion of the total population of Anderson and Pickens Counties, and the review team expects they would have a minimal impact on public services.

Education

Anderson County has six school districts with 49 schools and an overall kindergarten through 12th grade enrollment for the 2008-2009 school year of 30,875 students (NCES 2013). Pickens County has 25 schools with a 2010-2011 student enrollment of 16,319. The review team expects, based upon the same underlying assumptions that governed the analysis for the proposed Lee Nuclear Station site, that approximately 400 students would move into the two-county area during the peak employment period for building activities. Assuming equal distribution of those students between counties 200 additional students in each school district would represent a less than 5 percent increase in the student body population. Therefore, the review team determined building a nuclear facility on the Middleton Shoals site would have a minimal impact on education, and that the much smaller operations workforce would also have a minimal impact on education. Based on the information provided by Duke and the review team's independent evaluation, the review team concludes that public services and education impacts of building and operating two new nuclear units at the Middleton Shoals site would be minor.

Summary of Building and Operation Impacts

Physical impacts on workers and the general public include impacts on existing buildings, transportation, aesthetics, noise levels, and air quality. Social and economic impacts span issues of demographics, economy, taxes, infrastructure, and community services. In summary, based on information provided by Duke and the review team's independent evaluation, the review team concludes that the adverse impacts of building and operating a new nuclear plant at the Middleton Shoals site on socioeconomics would be minor for most of the region but could be noticeable, but not destabilizing, in terms of traffic-related and aesthetics impacts during peak project employment. During operations, these impacts are expected to be minor. The impacts on the Anderson County tax base during operations likely would be substantial and beneficial; however, only minor beneficial tax impacts would result in the rest of the region.

Cumulative Impacts

The projects identified in Table 9-14, particularly the future urbanization of the region, have contributed or would contribute to the demographics, economic climate, and community infrastructure of the region and generally result in increased urbanization and industrialization. Because the projects within the review area identified in Table 9-14 would be consistent with applicable land-use plans and control policies, the review team considers the cumulative socioeconomic impacts from the projects to be minimal.

For the analysis of socioeconomic impacts at the Middleton Shoals site, the geographic area of interest is considered to be the 50-mi region centered on the Middleton Shoals site, with special consideration of Anderson and Pickens Counties, where the review team expects socioeconomic impacts to be the greatest.

The Middleton Shoals site is located in eastern Anderson County on the South Carolina and Georgia border. The employment in the area near the Middleton Shoals site is a mixture of manufacturing, government, retail trade, and leisure and hospitality. The nearest large towns are Anderson (population 26,566) and Clemson (population 13,596), which is in Pickens County. Also within the 50-mi region of the Middleton Shoals site are the large metropolitan areas of Greenville, South Carolina (population 57,821)and Athens, Georgia (population 116,714) (USCB 2010e).

The cumulative impact analysis considers other past, present, and reasonably foreseeable future actions that could contribute to the cumulative socioeconomic impacts on a given region, including other Federal and non-Federal projects and the projects listed in Table 9-14. Adverse cumulative impacts would include physical impacts (on workers and the local public, buildings, transportation, and visual aesthetics), demographic impacts, and impacts on local infrastructures and community services (transportation; recreation; housing; water and wastewater facilities; police, fire, and medical services; social services; and education).

Because most projects described in Table 9-14 do not include any significant reasonably foreseeable changes in socioeconomic impacts within 50 mi of the Middleton Shoals site, the review team determined there would be no significant additional cumulative socioeconomic impacts in the region from those activities. Regional planning efforts and associated demographic projections available at a reconnaissance level formed the basis for the review team's assessment of reasonably foreseeable future impacts. Any economic impacts associated with activities listed in Table 9-14 would have been considered as part of the socioeconomic baseline.

The cumulative economic impacts on the community would be beneficial and SMALL with the exception of Anderson County, which would see a LARGE and beneficial cumulative impact on taxes. The cumulative infrastructure and community services impacts would be SMALL with the exception of a MODERATE and adverse cumulative impact on traffic near the Middleton Shoals site. The cumulative physical impacts would be SMALL with the exception of a MODERATE and adverse impact on aesthetics near the site. Building and operating the proposed units at the Middleton Shoals site would be a significant contributor to the LARGE and beneficial economic impact on taxes in Anderson County and also to the MODERATE and adverse impact on infrastructure and community services related to traffic near the site and the MODERATE physical impact on aesthetics. The review team concludes that building two nuclear units at the Middleton Shoals site, in addition to other past, present, and reasonably foreseeable future projects would have SMALL cumulative impacts on demography.

9.3.5.6 Environmental Justice

The 2006–2010 ACS five year population estimates at the census block group level were used to identify minority and low-income populations in the region, and used the same sources and methodology explained in Section 2.6.1 for the proposed site, including a closer look at potential areas of interest using a series of health and physical considerations. There were a total of 859 census block groups within the 50-mi region (USCB 2011a, d). Approximately 155 of these census block groups were classified as aggregate minority populations of interest, and 111 classified as African American populations of interest. There were also 3 census block groups described as Asian, 6"other" race, and 34 with Hispanic populations of interest. Anderson County had 21 census block groups with African American and 28 with aggregate minority populations of interest mainly located within Anderson city limits. There were 118 census block groups classified as having low-income populations of interest in the 50-mi region, of which 13 were in Anderson County, located within and near the Anderson city limits. The review team did not identify any Native American communities or other minority communities with the potential for a disproportionately high and adverse impact due to their unique characteristics or practices. Figure 9-9 shows the geographic locations of the minority populations of interest within the 50-mi radius of the Middleton Shoals site, and Figure 9-10 shows the geographic locations of the low-income populations of interest within the 50-mi radius of the Middleton Shoals site.

Physical impacts from building activities (e.g., noise, fugitive dust, air emissions, traffic) attenuate rapidly with distance, topography, and intervening vegetation. Therefore, the review team determined that, given the distance from the Middleton Shoals site to the nearest populations of interest, there would be no physical impacts with a disproportionately high and adverse effect on minority or low-income populations. For the same reasons, the review team determined the operation of the proposed project at the Middleton Shoals site is also unlikely to have a disproportionately high and adverse impact on minority or low-income populations. A supplemental water reservoir near the site would be needed, which would require acquiring private property from current residents and demolishing houses. New transmission-line corridors would be constructed to link the proposed units to the electric grid. Given the distance between the Middleton Shoals site and the location of minority and low-income populations of interest, impacts from the supplemental water pond and transmission-line corridors would not disproportionately and adversely affect minority or low-income populations. See Sections 2.6, 4.5, and 5.5 for more information about environmental justice criteria and impacts.

In addition to environmental justice impacts from building and operations, the cumulative analysis considers other past, present, and reasonably foreseeable future actions that could contribute to disproportionately high and adverse impacts on minority and low-income populations, including other Federal and non-Federal projects and the projects listed in Table 9-14. For the analysis of environmental justice impacts at the Middleton Shoals site, the geographic area of interest is considered to be the 50-mi region centered on the Middleton Shoals site.

The projects identified in Table 9-14 likely did not or would not contribute to environmental justice impacts of the region. Therefore, based on information provided by Duke and the review team's independent evaluation, the review team concludes there would not be any disproportionately high and adverse environmental justice cumulative impacts from the building and operation of two new nuclear units at the Middleton Shoals site in addition to other past, present, and reasonably foreseeable future projects, and the cumulative environmental justice impacts would be SMALL.

9.3.5.7 Historic and Cultural Resources

The following analysis includes building and operating two new nuclear generating units at the Middleton Shoals site in Anderson County, South Carolina. The analysis also considers other past, present, and reasonably foreseeable future actions that could cause cumulative impacts

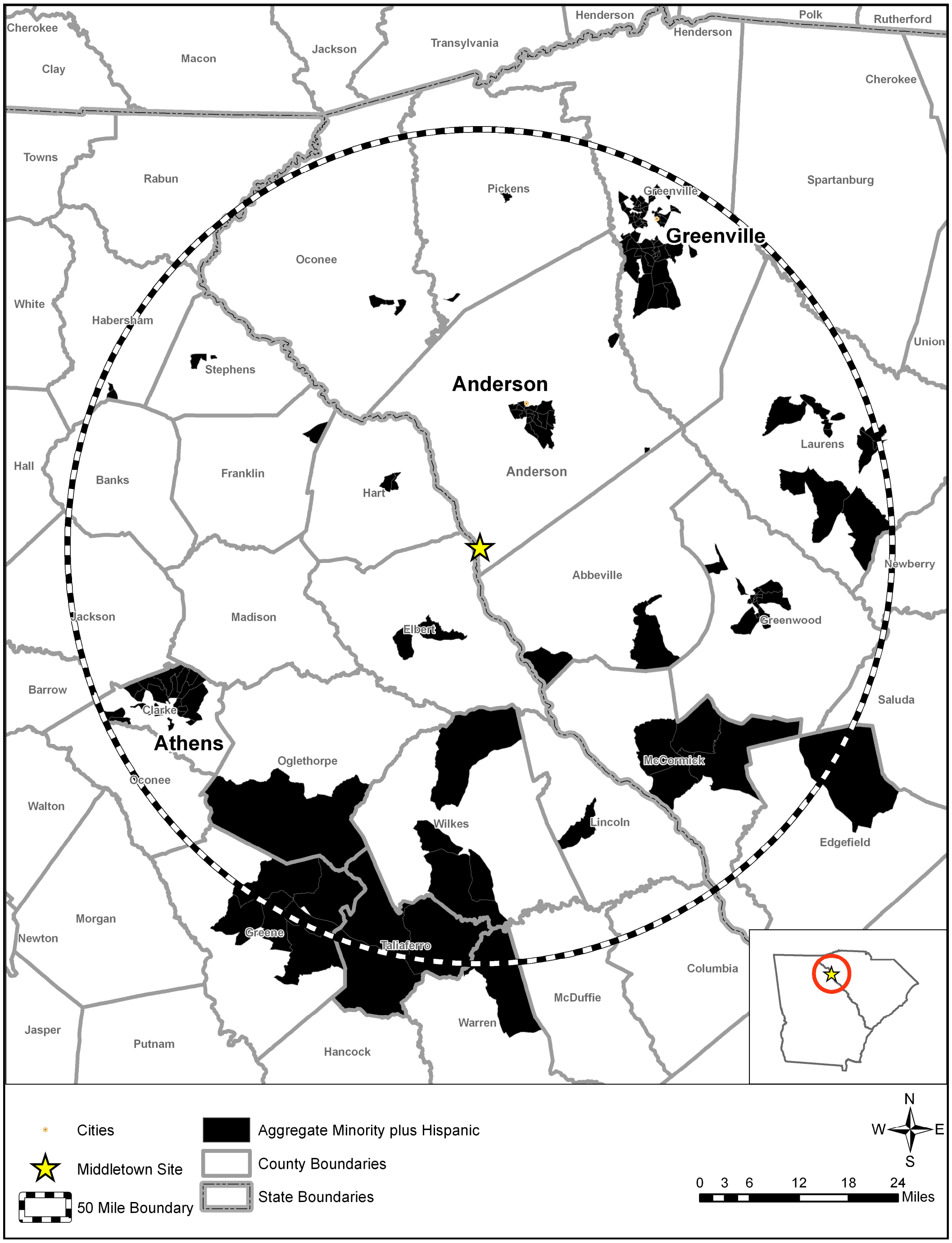

Figure 9-9. Aggregate Minority Populations in Block Groups that Meet the Environmental Justice Selection Criteria at the Middleton Shoals Site (USCB 2011a, d)

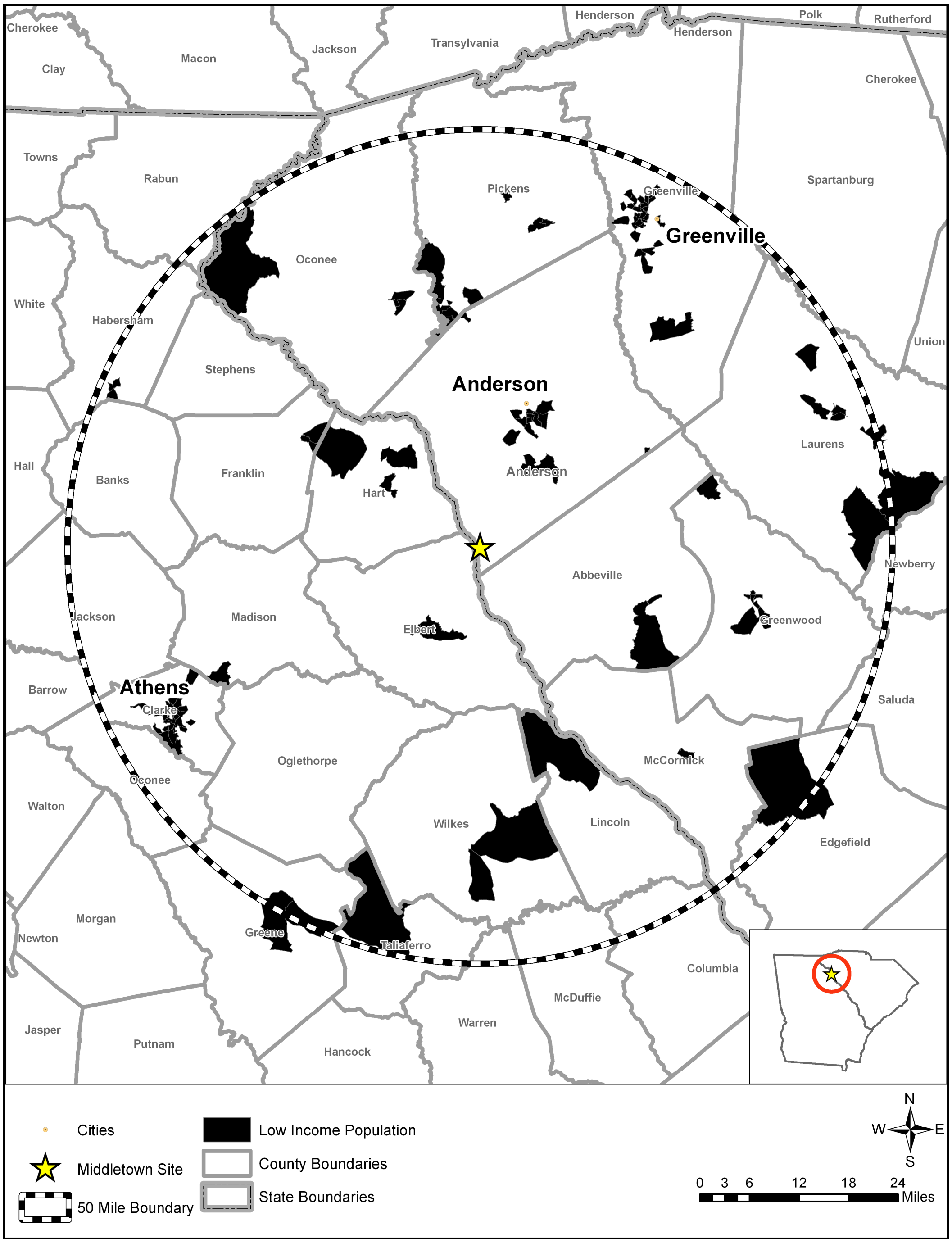

Figure 9-10. Low-Income Populations in Block Groups that Meet the Environmental Justice Selection Criteria at the Middleton Shoals Site (USCB 2011a, d)

on cultural resources, including other Federal and non-Federal projects as listed in Table 9-14. For the analysis of cultural resources impacts at the Middleton Shoals site, the geographic area of interest is considered to be the onsite and offsite direct physical and indirect visual APEs associated with the proposed undertaking. This includes direct physical APEs, defined as the onsite areas directly affected by site development and operation activities as well as offsite areas such as railroad corridors, transmission lines, and new reservoirs. Indirect visual APEs are also included and defined generally as a 1-mi radius buffer around the proposed direct, physical APEs, which encompasses the approximate maximum distance from which tall structures could be seen.

Reconnaissance activities in a cultural resources review have particular meaning. Typically such activities include preliminary field investigations to confirm the presence or absence of historic properties or cultural resources. However, in developing this EIS, the review team relied upon reconnaissance-level information to perform the alternative sites evaluation in accordance with ESRP 9.3 (NRC 2000a). In this context, reconnaissance-level information is data that are readily available from agencies and other public sources. It can also include information obtained through site visits. To identify historic and cultural resources at the Middleton Shoals site, the following information was used:

- the Lee Nuclear Station COL ER (Duke 2009c)
- an August 2010 informal tour of the Middleton Shoals site and visit to the South Carolina Room at the Anderson County Public Library in Anderson, South Carolina (NRC 2010c)
- archival records searches, National Register listings, and cultural resource probability assessments provided by Duke (Duke 2010t)
- the National Park Service's listing of properties on the National Register (NPS 2011b).

Site Description

Historically, the Middleton Shoals site and vicinity were largely undisturbed and contained intact archaeological resources associated with the past 10,000 years of human settlement. Only limited formal cultural resources investigations have been performed within the study area and no surveys have covered the direct physical APEs considered in this analysis (Duke 2010t).

Duke completed records searches at the South Carolina Department of Archives and History and the South Carolina Institute of Archaeology and Anthropology, and consulted online cultural resource listings through the GDNR to assemble a list of previously recorded cultural resources and historic properties listed or eligible for listing on the National Register that could be affected if the Middleton Shoals site was selected for nuclear plant development (Duke 2010t). According to the search results, no cultural resources investigations have been completed within the onsite direct physical APE for the new units and only limited investigations have been completed within the direct physical APE for the proposed reservoir and in the 1-mi buffer areas that constitute the indirect visual APEs. Even with limited previous surveys in the area, 46 cultural resources have been recorded through surveys and record searches in direct and indirect APEs associated with the Middleton Shoals site. No resources are known to occur in the direct physical APE for the new units, but two National Register-eligible prehistoric archaeological sites and a twentieth-century bridge, which may be eligible for the National Register, are adjacent to the plant site, and eight additional prehistoric archaeological sites are known to occur in the indirect visual APE associated with the proposed new units. Predictive modeling analyses completed by Duke (Duke 2010t) further indicate a high potential for additional archaeological resources to be present in the proposed plant site. One previously recorded prehistoric archaeological site and another twentieth-century bridge with potential for nomination to the National Register are known within the direct APE for the proposed reservoir and 33 additional historic architectural resources have been identified in this indirect APE, including a large historic farmstead complex and a potential historic district at the nearby town of Iva. Simple predictive modeling analyses completed by Duke (Duke 2010t) further indicate that approximately 90 percent of the lands included in the indirect visual APE for the new reservoir exhibit high potential for additional cultural resources and historic properties (i.e., well-drained soils, less than 15 percent slope, outside active floodplains or areas of seasonal or permanent inundation, largely undisturbed).

Building and Operation Impacts

In the event that the Middleton Shoals site was chosen for the proposed project, the review team assumes that Duke would employ the same methods for identifying and assessing impacts on historic properties and cultural resources as those utilized during assessments at the Lee Nuclear Station site and associated developments. This would include field investigations and coordination with the South Carolina SHPO, interested American Indian Tribes, and the public that would be conducted before the initiation of any ground-disturbing activities. The results of these investigations and communications would be used in the site planning process to avoid or mitigate impacts and develop protective measures for any significant resources such as those already listed on the National Register. Duke is committed to this approach for the Lee Nuclear Station site and the review team assumes that Duke would employ the same methods at alternative sites, if chosen for the proposed project (Duke 2009c). Cultural resources sensitivity at the Middleton Shoals site is predicted to be high, based on previous surveys and predictive modeling based on environmental and geographic features that are known attractors for human activity. Initial archival searches and predictive modeling analyses completed by Duke (Duke 2010t)indicate that at a minimum, appropriate mitigations would need to be developed for potential direct impacts on two known cultural resources in the proposed new reservoir site that are potentially eligible for the National Register; three National Register-eligible cultural resources and eight unassessed cultural resources in the 1-mi visual APE buffer around the proposed new units; and at least 33 known historic architectural resources in the indirect visual APE for the proposed reservoir. Additional important historic and cultural resources may also be discovered during new surveys in all APEs. As a result, impacts on cultural resources due to site development and building activities could be noticeable, but not destabilizing with appropriate mitigations implemented.

Impacts on historic and cultural resources from operation of the two new nuclear units at the Middleton Shoals site as well as parallel and related operations at offsite components, such as the new reservoir, railroad line, and transmission-line corridors, would be possible. The review team assumes that Duke Energy's corporate policy for consideration of cultural resources and associated procedures in the event of an unanticipated discovery of cultural resources would apply to operations at the Middleton Shoals site and offsite areas (Duke 2009j). Further, the review team assumes that Duke would negotiate an agreement and associated cultural resources management plan for the Middleton Shoals site with the South Carolina SHPO, the USACE, and interested American Indian Tribes similar to efforts completed for the Lee Nuclear Station site (USACE et al. 2013). Under consistent application of Duke Energy's corporate policy for cultural resources and an agreement and cultural resources management plan specific to the Middleton Shoals site, impacts on cultural resources due to operations would be negligible.

Cumulative Impacts

The geographic area of interest for cumulative impacts on historic and cultural resources at the Middleton Shoals site corresponds to the onsite and offsite direct (physical) and indirect (visual) APEs defined for the site. Past actions in the geographic area of interest that could have affected historic and cultural resources in a manner similar to those associated with the building and operation of the two new units and other project components include rural agricultural and limited residential development. Table 9-14 also lists future projects that may similarly affect historic and cultural resources and contribute to cumulative impacts in the geographic area of interest, including transportation improvements associated with the South Carolina Strategic Corridor System Plan (SCDOT 2009b) and new developments associated with future urbanization in the region. These projects could affect historic and cultural resources through ground-disturbance or visual impacts on historic settings or architectural properties, but the inclusion of Federal funding in most of these efforts should ensure appropriate mitigation.

Cultural resources are non-renewable; therefore, the impact of destruction of cultural resources is cumulative. Based on the information provided by Duke and the review team's independent evaluation, the review team concludes that the cumulative impacts from past agricultural and residential development, future State and Federal transportation improvements, future urbanization of the area, and the building and operation of two new nuclear units on the Middleton Shoals site would be MODERATE. The incremental contribution of building and operating the two new units and associated plant components would be significant to these cumulative impacts given the 46 historic properties and cultural resources known to exist in onsite and offsite indirect visual APEs and the high probability for additional cultural resource discoveries in all APEs and the geographic area of interest.

9.3.5.8 Air Quality

The following impact analysis includes impacts on air quality from building activities and operations. The analysis also considers other past, present, and reasonably foreseeable future actions that affect air quality, including other Federal and non-Federal projects listed in Table 9-14. The air-quality impacts related to building and operating a nuclear facility at the Middleton Shoals site would be similar to those at the Lee Nuclear Station site.

The Middleton Shoals site is located in Anderson County, South Carolina, which is part of the Greenville-Spartanburg Intrastate Air Quality Control Region (40 CFR 81.106). The geographic area of interest for this resource area is the 50-mi radius of the site, which includes Anderson County. Designations of attainment or nonattainment are made on a county-by-county basis. Anderson County is designated as unclassifiable or in attainment for all criteria pollutants for which NAAQS have been established (40 CFR 81.341). Criteria pollutants include ozone, PM, CO, No_x, SO_2, and lead. Anderson County came into attainment with the 8-hour ozone standard on April 15, 2008, and is, therefore, considered a maintenance area for ozone (40 CFR 81.341). An applicability analysis would need to be performed per 40 CFR Part 93 Subpart B to determine if a general conformity determination is needed. The closest Class 1 Federal Area (i.e., Shining Rock Wilderness Area, North Carolina) is more than 50 mi from the Middleton Shoals site and it would, therefore, not likely be affected by minor source emissions from the site. Class I areas are considered of special national or regional natural, scenic, recreational, or historic value and are afforded additional air quality protection.

As described in Section 4.7, emissions of criteria pollutants from building the two units are expected to be temporary and limited in magnitude. As discussed in Section 5.7, emissions of criteria pollutants from operations would be primarily from the intermittent use of standby diesel generators and pumps. Given the temporary air emissions from construction and intermittent air emissions from operation, and that Anderson County is currently designated as being unclassified or in attainment for criteria pollutants, the review team concludes the impacts from building and operating two new units on air quality would be minimal.

Cumulative impacts on air quality resources are estimated based on the information provided by Duke and the review team's independent evaluation. Of the projects listed in Table 9-14, two energy-related projects (the John Rainey Generating Station and the Anderson Regional Landfill Generating Station) are considered major sources of NAAQS criteria pollutants in Anderson County. In addition, several industrial facilities listed in Table 9-14 are major sources of NAAQS criteria pollutants in Anderson County. Other past, present, and reasonably foreseeable activities exist in the geographic area of interest that could affect air quality resources. The impacts on criteria pollutants in Anderson County from emissions of effluents from the

Middleton Shoals site and nearby major sources, and other projects and activities within 50 mi of the region would not be noticeable.

The greenhouse gas emissions from two nuclear units at the Middleton Shoals site would be the same as those analyzed in Chapters 4, 5, and 6 for the Lee Nuclear Station site. The cumulative impacts of greenhouse gas emissions related to nuclear power are discussed in Section 7.6. The impacts of the emissions are not sensitive to location of the source. Consequently, the conclusion in Section 7.6—national and worldwide impacts of greenhouse gas emissions are noticeable but not destabilizing—is applicable to two AP1000 reactors located at the Middleton Shoals site.

The review team concludes that the cumulative impacts, including those from other past, present, and reasonably foreseeable future actions on air quality resources in the geographic area of interest would be SMALL for criteria pollutants and MODERATE for greenhouse gas emissions. The incremental contribution of impacts on air quality resources from building and operating two units at the Middleton Shoals site would not be significant to the MODERATE air-quality impact from greenhouse gas emissions.

9.3.5.9 Nonradiological Health Impacts

The following analysis considers nonradiological health impacts from building and operating two new nuclear units at the Middleton Shoals alternative site. Impacts on nonradiological health at the Middleton Shoals site are estimated based on the information provided by Duke and the review team's independent evaluation. The analysis also includes past, present, and reasonably foreseeable future actions that could contribute to the cumulative nonradiological health impacts on site workers and the public, including other Federal and non-Federal projects and the projects listed in Table 9-14. For the analysis of nonradiological health impacts at the Middleton Shoals site, the geographic area of interest is considered to be the 6-mi vicinity centered on the Middleton Shoals site and the associated transmission-line corridors based on the localized nature of nonradiological health impacts.

Building activities with the potential to affect the health of members of the public and workers at the Middleton Shoals site include exposure to dust, vehicle exhaust, and emissions from construction equipment; noise; occupational injuries; and the transport of construction materials and personnel to and from the site. The operation-related activities that may affect the health of members of the public and workers include exposure to etiological agents, noise, occupational injuries, EMFs, and impacts from the transport of workers to and from the site.

Building Impacts

Nonradiological health impacts on construction workers and members of the public from building two new nuclear units at the Middleton Shoals alternative site would be similar to those evaluated in Section 4.8. Duke would comply with applicable Federal and State regulations on air quality and noise during the site-preparation and building phase. The frequency of construction worker accidents would not be expected to be different from the frequency of accidents estimated for the proposed Lee Nuclear Station site.

Section 4.8.3 concludes that the impacts on nonradiological health from the transport of construction workers and materials to and from the Lee Nuclear Station site would be minimal. Impacts at the Middleton Shoals site would be about 31 percent lower than the estimated impacts for the Lee Nuclear Station site. This difference is due to differences in the average State-specific fatality rates used for construction workers (transportation calculations use the closest population center for transportation data, which is located in Georgia). Impacts on nonradiological health related to transportation at the Middleton Shoals alternative site would be minimal.

The Middleton Shoals site is a greenfield site located in a rural area and will require extensive rough grading (Duke 2009c). Impacts from building activities, including the associated transmission lines and a 3700-ac supplemental cooling-water reservoir at the Middleton Shoals site would be minimal.

Operational Impacts

Nonradiological health impacts from operation of two new nuclear units on site workers and members of the public at the Middleton Shoals site would be similar to those evaluated in Section 5.8 for the proposed Lee Nuclear Station site. Occupational health impacts on workers (e.g., falls, electric shock, or exposure to other hazards) at the Middleton Shoals site would likely be the same as those evaluated for workers at the Lee Nuclear Station site. Russell Reservoir would be the source of cooling water and the recipient of thermal discharge for two proposed nuclear units at the Middleton Shoals site. The Savannah River downstream of the alternative site location is listed as impaired for mercury, fecal coliform, and turbidity (EPA 2010am). Due to pre-existing water-quality issues, exposure to the public from waterborne etiological agents at the Middleton Shoals site could be more likely than at the proposed or other alternative sites. Operation of new nuclear units at the Middleton Shoals site could lead to an increase in waterborne diseases in the vicinity. Noise and EMF exposure would be monitored and controlled in accordance with applicable OSHA regulations. Effects of EMF on human health would be controlled and minimized by conformance with NESC criteria (IEEE 2012).

Impacts from transportation of operations workers to and from the Middleton Shoals site would result in about a 6 percent increase in traffic fatalities in Anderson County. This difference in this increase of fatalities from that at the Lee Nuclear Station site is due to the difference in the average county-specific baseline annual fatalities (between Cherokee and Anderson County). Because this increase is small relative to the baseline traffic fatalities (i.e., before the new units are constructed) in Anderson County, the review team concludes that the impacts of transporting construction materials and personnel to the Middleton Shoals site would be minimal. The review team concludes that nonradiological health impacts on site workers and public from the operation of the two nuclear units at the Middleton Shoals alternative site would be minimal.

Cumulative Impacts

The past development and current operation of the Rainey Generating Station, a 1095-MW, six-unit natural-gas-fired peaking power plant, located approximately 6 mi north-northwest of the Middleton Shoals site, could contribute to cumulative nonradiological health impacts. Past nonradiological health impacts would have been localized and temporary, and current impacts from the Rainey Generating Station could include emissions from station operation and discharge of thermal effluents to the Savannah River. Rainey Generating Station holds current air permits and an NPDES major industrial permit subject to SCDHEC regulation, and would be expected to comply with the limitations in those permits (EPA 2010am). Operation of the Rainey Generating Station would not contribute significantly to cumulative nonradiological health impacts in the vicinity of the Middleton Shoals site.

There are no proposed future actions that would have nonradiological health impacts similar to development at the Middleton Shoals site. However, transmission-line creation and/or upgrading in the vicinity of the Middleton Shoals site and future urbanization would be expected to occur.

The review team is also aware of the potential climate changes that could affect human health—a recent compilation of the state of knowledge in this area (GCRP 2009) has been considered in the preparation of this EIS. Projected changes in the climate of the southeast during the life of the proposed nuclear station include a small increase in average temperature and a decrease in precipitation in winter, spring, and summer, and a small increase in precipitation in fall (GCRP 2009). This may result in a small, gradual increase in river water temperature, which may alter the presence of microorganisms and parasites in the Savannah River/Russell Reservoir. While the changes that are attributed to climate change in these studies (GCRP 2009) may not be insignificant on a national or global level, the review team did not identify anything that would alter its conclusion regarding the presence of etiological agents or change the incidence of waterborne diseases in the vicinity of the Middleton Shoals site. The review team concludes that the nonradiological health cumulative impacts from building two new nuclear units, associated transmission lines, and offsite reservoir at the Middleton Shoals site would be minimal.

Summary

Nonradiological health impacts from building and operating two new units at the Middleton Shoals site are estimated based on the information provided by Duke and the review team's independent evaluation. The review team concludes that nonradiological health impacts on construction workers and the public resulting from the building of two new nuclear units, associated transmission lines, and offsite reservoir at the Middleton Shoals site would be minimal. The review team also expects that the occupational health impacts on members of the public and operations workers from two new nuclear units at the Middleton Shoals site would be minimal. Finally, the review team concludes that cumulative nonradiological health impacts from related past, present, and future actions in the geographic area of interest would be SMALL. As discussed in Section 5.8, the NRC staff is not able to come to a conclusion on the chronic impacts of EMFs.

9.3.5.10 Radiological Health Impacts of Normal Operations

The following impact analysis includes radiological health impacts on the public and workers from building activities and operations for two nuclear units at the Middleton Shoals alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that could have radiological health impacts, including other Federal and non-Federal projects and the projects listed in Table 9-14. As described in Section 9.3.5, the Middleton Shoals site is a greenfield site; there are currently no nuclear facilities on the site. The geographic area of interest is the area within a 50-mi radius of the Middleton Shoals site. The only facility potentially affecting radiological health within this geographic area of interest is the existing Oconee Nuclear Station, located about 37 mi north of the Middleton Shoals site. In addition, medical, industrial, and research facilities that use radioactive material are likely to be within 50 mi of the Middleton Shoals site.

The radiological impacts of building and operating the proposed two AP1000 units at the Middleton Shoals site include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways would result in low doses to people and biota offsite that would be well below regulatory limits. The impacts are expected to be similar to those at the Lee Nuclear Station site.

The radiological impacts of Oconee Units 1, 2, and 3 include doses from direct radiation and liquid and gaseous radioactive effluents. These pathways result in low doses to people and biota offsite that are well below regulatory limits as demonstrated by the ongoing radiological environmental monitoring program conducted around Oconee Nuclear Station. The NRC staff concludes that the dose from direct radiation and effluents from medical, industrial, and research facilities that use radioactive material would be an insignificant contribution to the cumulative impact around the Middleton Shoals site. This conclusion is based on data from the radiological environmental monitoring programs conducted around currently operating nuclear power plants. Based on the information provided by Duke and the NRC staff's independent analysis, the NRC staff concludes that the cumulative radiological impacts from building and operating the two proposed AP1000 units and other existing and planned projects and actions in the geographic area of interest around the Middleton Shoals site would be SMALL.

9.3.5.11 Postulated Accidents

The following impact analysis includes radiological impacts from postulated accidents from the operation of two nuclear units at the Middleton Shoals alternative site. The analysis also considers other past, present, and reasonably foreseeable future actions that affect radiological health from postulated accidents, including other Federal and non-Federal projects and the projects listed in Table 9-14. As described in Section 9.3.5, the Middleton Shoals site is a greenfield site; there are currently no nuclear facilities at the site. The geographic area of interest considers all existing and proposed nuclear power plants that have the potential to increase theprobability-weighted consequences (i.e., risks) from a severe accident at any location within 50 mi of the Middleton Shoals alternative site. Facilities potentially affecting radiological accident risk within this geographic area of interest are the existing Oconee Nuclear Station Units 1, 2, and 3, VEGP Units 1 and 2, and VCSNS Unit 1. Two additional units are also under construction at both the VEGP and VCSNS sites. Other facilities potentially affecting radiological accident risk within this geographic area of interest include the DOE SRS and the Mixed Oxide (MOX) Fuel Fabrication Facility at the SRS.

As described in Section 5.11.1, the NRC staff concludes that the environmental consequences of DBAs at the Lee Nuclear Station site would be minimal for AP1000 reactors. DBAs are addressed specifically to demonstrate that a reactor design is robust enough to meet NRC safety criteria. The AP1000 design is independent of site conditions, and the meteorology of the Middleton Shoals alternative and Lee Nuclear Station sites are similar; therefore, the NRC staff concludes that the environmental consequences of DBAs at the Middleton Shoals alternative site would be minimal.

Assuming the meteorology, population distribution, and land use for the Middleton Shoals alternative site are similar to the proposed Lee Nuclear Station site, risks from a severe accident for an AP1000 reactor located at the Middleton Shoals alternative site are expected to be similar to those analyzed for the proposed Lee Nuclear Station site. The risks for the proposed Lee Nuclear Station site are presented in Tables 5-14 and 5-15 and are well below the median value for current-generation reactors. In addition, as discussed in Section 5.11.2, estimates of average individual early fatality and latent cancer fatality risks are well below the Commission's safety goals (51 FR 30028). For existing plants within the geographic area of interest (Oconee Nuclear Station Units 1, 2, and 3; VEGP Units 1 and 2; and VCSNS Unit 1), the Commission has determined that the probability-weighted consequences of severe accidents are small (10 CFR Part 51, Appendix B, Table B-1). Finally, according to the EISs for the Vogtle ESP (NRC 2008h) and the VCSNS Units 2 and 3 COLs (NRC 2011f) the risks from the units under construction would also be well below risks for current-generation reactors and would meet the Commission's safety goals.

There are no reactors currently operating at DOE's SRS; however, there is some severe accident risk associated with the spent nuclear fuel and other high-level radioactive wastes that may be processed or stored at SRS. The severe accident risks associated with stored spent fuel at operating nuclear power plants are lower than the risks for severe accidents involving the reactor core. Likewise, the severe accident risks associated any spent reactor fuel or other high-level radioactive waste processed or stored at SRS would be lower than the risks for severe accidents involving the reactor core. There is no irradiated fuel at the MOX Fuel Fabrication Facility at SRS, and this facility is designed to prevent inadvertent criticalities. Other facilities at SRS may contain substantial amounts of radioactive material, but there is no credible severe accident risk like there is for an operating reactor. Therefore, the additional risk from these facilities is not significant in the evaluation of the cumulative severe accident risk for a nuclear power plant at the Middleton Shoals alternative site. On this basis, the NRC staff concludes that the cumulative risks from severe accidents at any location within 50 mi of the Middleton Shoals alternative site would be SMALL.

9.3.6 Comparison of the Impacts of the Proposed Action and the Alternative Sites

This section summarizes the review team's characterization of the cumulative impacts related to locating a two-unit AP1000 nuclear power facility at the proposed Lee Nuclear Station site and at each alternative site. The three sites selected for detailed review as part of the alternative sites environmental analysis included the Perkins site located in Davie County, North Carolina; the Keowee site located in Oconee County, South Carolina; and the Middleton Shoals site located in Anderson County, South Carolina. Comparisons are made between the proposed site and alternatives to evaluate whether one of the alternative sites is environmentally preferable to the proposed site. The NRC's determination is independent of the USACE's determination under the 404 Guidelines of whether the Lee Nuclear Station site is the least environmentally damaging practical alternative (LEDPA). The USACE will conclude its analysis of both offsite and onsite alternatives in its Record of Decision. The USACE alternatives evaluation is discussed in Section 9.5. The need to compare the proposed site with alternative sites arises from the requirement in NEPA Section 102(2)(C)(iii) (42 U.S.C. 4332) that EISs include an analysis of alternatives to the proposed action. The NRC criterion to be used in assessing whether a proposed site is to be rejected in favor of an alternative site is based on whether the alternative site is "obviously superior" to the site proposed by the applicant (Public Service Company of New Hampshire 1977). An alternative site is "obviously superior" to the proposed site if it is "clearly and substantially" superior to the proposed site (Rochester Gas & Electric Corp. 1978). The standard of obviously superior "...is designed to guarantee that a proposed site will not be rejected in favor of an alternate unless, on the basis of appropriate study, the Commission can be confident that such action is called for" (New England Coalition on Nuclear Pollution 1978).

The "obviously superior" test is appropriate for two reasons. First, the analysis performed by the NRC in evaluating alternative sites is necessarily imprecise. Key factors considered in the alternative site analysis, such as population distribution and density, hydrology, air quality, aquatic and terrestrial ecological resources, aesthetics, land use, and socioeconomics are difficult to quantify in common metrics. Given this difficulty, any evaluation of a particular site must have a wide range of uncertainty. Second, the applicant's proposed site has been analyzed in detail, with the expectation that most of the adverse environmental impacts associated with the site have been identified. The alternative sites have not undergone a comparable level of detailed study. For these reasons, a proposed site may not be rejected in favor of an alternative site when the alternative site is marginally better than the proposed site, but only when it is obviously superior (Rochester Gas & Electric Corp. 1978). NEPA does not require that a nuclear plant be constructed on the single best site for environmental purposes. Rather, "...all that NEPA requires is that alternative sites be considered and that the effects on the environment of building the plant at the alternative sites be carefully studied and factored into the ultimate decision" (New England Coalition on Nuclear Pollution 1978).

Section 9.3.6.1 discusses the process the review team used to compare cumulative impacts of the alternative sites to the proposed Lee Nuclear Station site and provides the final cumulative impact for each resource category. Cumulative impact levels from Chapter 7 (for the Lee Nuclear Station), and the three alternative sites (from Sections 9.3.3 through 9.3.5) are listed in Table 9-18. Section 9.3.6.2 discusses the cumulative impacts of the proposed project located at the Lee Nuclear Station site and at the alternative sites as they relate to a determination of environmental preference or obvious superiority.

Table 9-18. Comparison of Cumulative Impacts at the Lee Nuclear Station Site and Alternative Sites

Resource Category	Lee Nuclear Station[(a)]	Perkins	Keowee	Middleton Shoals
Land Use	MODERATE	MODERATE	MODERATE	MODERATE
Water-Related				
Surface-water use	MODERATE	MODERATE	MODERATE	MODERATE
Groundwater use	SMALL	SMALL	SMALL	SMALL
Surface-water quality	SMALL	MODERATE	MODERATE	MODERATE
Groundwater quality	SMALL	SMALL	SMALL	SMALL
Ecology				
Terrestrial and wetland ecosystems	MODERATE	MODERATE	MODERATE	MODERATE
Aquatic ecosystems	MODERATE	MODERATE	MODERATE	MODERATE
Socioeconomics				
Physical impacts	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Demography	SMALL	SMALL	SMALL	SMALL

Table 9-18. (contd)

Resource Category	Lee Nuclear Station[(a)]	Perkins	Keowee	Middleton Shoals
Economic impacts on the community	SMALL to LARGE (beneficial)	SMALL to LARGE (beneficial)	SMALL to LARGE (beneficial)	SMALL to LARGE (beneficial)
Infrastructure and community services	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE	SMALL to MODERATE
Environmental Justice	SMALL	SMALL	SMALL	SMALL
Historic and Cultural Resources	MODERATE	MODERATE	MODERATE	MODERATE
Air Quality				
Criteria pollutants	SMALL	SMALL	SMALL	SMALL
Greenhouse gas emissions	MODERATE	MODERATE	MODERATE	MODERATE
Nonradiological Health	SMALL	SMALL	SMALL	SMALL
Radiological Health	SMALL	SMALL	SMALL	SMALL
Postulated Accidents	SMALL	SMALL	SMALL	SMALL

(a) From Table 7-4.

9.3.6.1 Comparison of Cumulative Impacts at the Proposed and Alternative Sites

The following section summarizes the review team's independent assessment of the proposed and alternative sites. The team characterized the expected cumulative environmental impacts of building and operating new units at the Lee Nuclear Station site and alternative sites; these impacts are summarized by category in Table 9-18. Full explanations for the specific impact characterizations are provided cumulatively in Chapter 7 for the proposed site and in Sections 9.3.3, 9.3.4, and 9.3.5 for each of the alternative sites. The review team's impact category levels are based on professional judgment, experience, and consideration of controls likely to be imposed under Federal, State, or local permits that would not be acquired until after the review of a COL application is underway. The considerations and assumptions were similarly applied at each of the alternative sites to provide a common basis for comparison. In the following discussion, the review team compares the impact levels between the proposed site and each alternative site.

The cumulative environmental impact areas listed in the table have been evaluated using the NRC's three-level standard of significance: SMALL, MODERATE, or LARGE. These levels were developed using CEQ guidelines and are set forth in the footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B:

> SMALL – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.

MODERATE – Environmental effects are sufficient to alter noticeably, but not to destabilize important attributes of the resource.

LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

9.3.6.2 Environmentally Preferable Sites

The cumulative impacts of building and operating two new nuclear units at the Lee Nuclear Station site and at each alternative site are SMALL for several impact categories. The resource categories for which the impact level at an alternative site would be the same as the proposed site would not contribute to the determination that the alternative site is environmentally preferable to the proposed site. Therefore, these categories are not discussed further in determining whether an alternate site is environmentally preferable to the proposed site. Where there is a range of impacts for a resource, the upper range of the resource is used for the comparison. In addition, for those cases in which the cumulative impacts for a resource would be greater than SMALL, consideration is given to those cases in which the impacts of the project at the specific site would not make a significant contribution to the cumulative impact level.

As shown in Table 9-18, there are only minor differences in impacts among the sites. All of the sites are in rural areas with similar physiographic, ecological, cultural resource, and socioeconomic characteristics. Use of any of the sites would require building one or more large, supplemental cooling-water reservoirs that would inundate stream valleys. Use of the cooling-water reservoirs reduces the impacts on surface water use at each site.

Table 9-18 indicates that the cumulative impacts on surface-water quality for the Lee Nuclear Station site are SMALL, and that the impact at each of the alternative sites is MODERATE. However, for the alternative sites, building and operating two nuclear units is not a significant contributor to the MODERATE impact. Therefore, surface-water-quality impacts do not serve to differentiate between the sites.

The review team concludes that the alternative sites and the Lee Nuclear Station site are generally comparable, and it would be difficult to state that one site is preferable to another from an environmental perspective. In such a case, the proposed site prevails because none of the alternatives are clearly environmentally preferable.

9.3.6.3 Obviously Superior Sites

None of the alternative sites was determined to be environmentally preferable to the Lee Nuclear Station site. Therefore, none of the alternative sites is obviously superior to the Lee Nuclear Station site.

9.4 System Design Alternatives

The review team considered a variety of heat-dissipation systems and circulating-water system (CWS) alternatives. While other heat-dissipation systems and water systems are part of a nuclear power plant, the largest and most capable of causing environmental impacts is the CWS that cools and condenses the steam for the turbine generator. Other water systems, such as the service-water system, are much smaller than the CWS. As a result, the review team only considers alternative heat-dissipation and water-treatment systems for the CWS. The proposed CWS for the Lee Nuclear Station Units 1 and 2 is a closed-cycle system that uses mechanical draft cooling towers for heat dissipation (Duke 2009c). The proposed system is discussed in detail in Chapter 3.

9.4.1 Heat-Dissipation Systems

About two-thirds of the heat from a commercial nuclear reactor is rejected as heat to the environment. The remaining one-third of the reactor-generated heat is converted into electricity. Normal heat-sink cooling systems transfer the rejected heat load into the atmosphere and/or nearby waterbodies, primarily as latent heat exchange (evaporating water) or sensible heat exchange (warmer air or water). Different heat-dissipation systems rely on different exchange processes. The following sections describe alternative heat-dissipation systems considered by the review team for the Lee Nuclear Station Units 1 and 2.

In its ER, Duke considered a range of CWS heat-dissipation systems, including a once-through cooling system and several closed-cycle cooling systems. In addition to the closed-cycle mechanical draft cooling towers selected, Duke considered natural draft cooling towers, once-through cooling into the Broad River, cooling ponds, spray ponds, dry cooling towers, and a combination wet-dry hybrid cooling-tower system (Duke 2009c). Duke also considered rectangular mechanical draft cooling towers in addition to the circular design chosen for the site (Duke 2009c). In addition, the review team considered mechanical draft cooling towers with plume abatement.

9.4.1.1 Wet Natural Draft Cooling Towers

Wet natural draft cooling towers, which use about the same amount of water as the proposed mechanical draft cooling towers, induce airflow up through large (600 ft tall and 400 ft in diameter) towers by cascading warm water downward in the lower portion of the cooling tower. As heat transfers from the water to the air in the tower, the air becomes more buoyant and rises. This buoyant circulation induces more air to enter the tower through its open base. The environmental aspects of wet natural draft cooling towers and mechanical draft cooling towers are very similar (Duke 2009c). Because both rely on evaporation to dissipate the heat, water use is similar between natural and mechanical draft cooling towers; therefore, intake and discharge effects on aquatic biota would be similar. Notable differences are that natural draft cooling towers can be seen from a greater distance and that the additional height increases the potential for avian and bat collisions (NRC 2013a). The large size of the natural draft cooling towers could have a greater visual and aesthetic impact than mechanical draft cooling towers. Because the Lee Nuclear Station site is located in a remote area, the aesthetic impacts of wet natural draft towers would be similar because visual impacts would be dominated by the plume rather than the tower. The likelihood of bird collision impacts is somewhat lower for the proposed mechanical draft cooling towers than for natural draft cooling towers. Also, the energy savings from using natural draft versus mechanical draft cooling towers are minimal. Therefore, the review team determined that wet natural draft cooling towers would not be an environmentally preferable alternative for the Lee Nuclear Station site.

9.4.1.2 Once-Through Cooling

Once-through cooling systems withdraw water from the source waterbody and return virtually the same volume of water to the receiving waterbody at an elevated temperature. Typically the source waterbody and the receiving waterbody are the same body, and the intake and discharge structures are separated to limit recirculation. While there is essentially no consumptive use of water in a once-through heat-dissipation system, the elevated temperature of the receiving waterbody would result in some induced evaporative loss that decreases the net water supply. The elevated temperature can also adversely affect the biota of the receiving waterbody. The large intake flows would result in impingement and entrainment losses. Based on recent changes to implementation plans to meet Section 316(b) of the Clean Water Act, the review team has determined that once-through cooling systems for new nuclear reactors are unlikely to be permitted in the future, except in rare and unique situations.

If proposed Lee Nuclear Station Units 1 and 2 were to use once-through cooling with two AP1000 reactors, the review team determined that the water-supply needs for the two units would be approximately 1,700,000 gpm (NRC 2011f). Duke has determined that the needed volume of water cannot be practically supplied by the Broad River (Duke 2009c). For this reason, in addition to the Clean Water Act 316(b) considerations, the review team determined that once-through designs were not a feasible alternative design and eliminated it from further consideration as part of the proposed Lee Nuclear Station Units 1 and 2 cooling system.

9.4.1.3 Cooling Pond

Use of a recirculating cooling pond separate from the Broad River was considered as an alternative cooling system design. Studies performed by Duke to determine the size pond needed for two AP1000s show that a recirculating pond would likely need to cover an area of 7000 ac (Duke 2009c). The topography around the Lee Nuclear Station site does not allow construction of a pond this size. Even if it did, the pond would eliminate substantially greater areas of wetlands, terrestrial habitat, and natural surface-water habitat than would other CWS alternatives. The review team determined that due to limitations of the surrounding topography, the impact of the loss of land and natural habitat associated with development of additional cooling ponds, a cooling system using a recirculating cooling pond was not an environmentally preferable alternative at the Lee Nuclear Station site.

9.4.1.4 Spray Canals

Spray-canal cooling systems use engineered canals to cool water and enhance evaporative cooling by spraying water into the atmosphere. In addition to evaporation, heat transfer from the spray canals to the atmosphere occurs through black-body radiation and conduction. A spray-canal system alternative was evaluated for cooling proposed Lee Nuclear Station Units 1 and 2, and was determined to require a canal approximately 2.5 mi long and 200 ft wide (Duke 2009c). The canal would require a water area of approximately 60 ac and a disturbance area of approximately 90 ac, assuming that an additional land area of 50 percent were required for temporary disturbance. Because of the linear geometry of the spray canal, Duke would likely have to acquire offsite land, cross and close off public roadways, and would have little flexibility to avoid wetlands and other sensitive habitat. Furthermore, terrestrial and aquatic habitat adjacent to the canal could be exposed to drift from spray operations. Based on the additional land and terrain requirements to build the spray canal and the possible impact from spray drift, the review team concludes that use of a spray canal would not be an environmentally preferable alternative for the Lee Nuclear Station site.

9.4.1.5 Dry Cooling Towers

Dry cooling towers have never been used to cool nuclear or fossil facilities of this size. Dry cooling towers would eliminate virtually all water-related impacts from the cooling system operation. No makeup water would be needed for cooling, and no blowdown water would be generated. This alternative could reduce water-use impacts, and likely avoid impacts associated with the building of Make-Up Pond C. Dry cooling systems would be larger than the proposed cooling-tower systems, and would require more onsite land to accommodate the large dry cooling structures. Dry cooling systems can result in a significant loss in dependable electrical generation capacity particularly during higher ambient temperature conditions because the theoretical approach temperature is limited to the dry-bulb temperature and not the lower wet-bulb temperature. The review team determined that historical local air temperatures would result in the loss of generation at critical times of high demand for electricity due to the loss of sufficient condenser vacuum. The dry cooling system design would not allow the plant to meet its stated goal as a baseload power source. Additional electrical losses occur with dry cooling due to the parasitic energy requirements of the large array of fans involved. This loss in generation efficiency translates into increased impacts on the fuel cycle. The review team therefore determined that building and operation of dry cooling towers would not be an environmentally preferable alternative for the Lee Nuclear Station site due to the impact on plant availability and capacity, as well as inefficiencies in energy production resulting in higher fuel-cycle impacts.

9.4.1.6 Combination Wet/Dry Hybrid Cooling-Tower System

Combination wet/dry hybrid cooling towers have never been used to cool nuclear or fossil facilities of the size proposed by Duke (i.e., 2234 MW(e)). A mechanical draft wet/dry hybrid cooling-tower system uses both wet and dry cooling cells to limit consumption of cooling water, often with the added benefit of reducing plume visibility. Water used to cool the turbine generators generally passes first through the dry portion of the cooling tower where heat is removed by drawing air at ambient temperature over tubes through which the water is moving. Cooling water leaving the dry portion of the tower then passes through the wet tower where the water is sprayed into a moving air stream and additional heat is removed through evaporation and sensible heat transfer. When ambient air temperatures are low, the dry portion of these cooling towers may be sufficient to meet cooling needs. The use of the dry portion of the system would result in a loss in generating efficiency that would translate into increased impacts on the fuel cycle. Duke provided an analysis of a hybrid cooling system design for proposed Lee Nuclear Station Units 1 and 2. For hybrid cooling towers, approximately 5500 ac-ft of additional supplemental water would be required compared to approximately 11,000 ac-ft of supplemental water to support wet cooling towers for Lee Nuclear Station Units 1 and 2 (Duke 2010k, Duke 2011e). The hybrid cooling system design would also increase the acreage of jurisdictional wetlands affected by about 62 percent but reduce the linear feet of jurisdictional streams affected by about 15 percent compared to the proposed wet cooling-tower system, due to the need to relocate several facilities of the proposed design to accommodate the large size of the dry cooling towers (Duke 2011h). Therefore, the hybrid cooling system would not eliminate the need for Make-Up Pond C or the impacts associated with its construction. The review team determined that while the hybrid cooling technology appears to be feasible for Lee Nuclear Station site, it still poses several significant technical challenges for its installation and operation. Therefore, the review team concludes that the building and operation of a combined wet/dry cooling-tower system would not be an environmentally preferable alternative for the Lee Nuclear Station site.

9.4.1.7 Mechanical Draft with Plume Abatement

Adding additional heat to a saturated cooling-tower exhaust, without adding additional water, would result in subsaturated water vapor. Subsaturated water vapor reduces the potential for a visible plume. The concept behind a mechanical draft cooling tower with plume abatement is similar to the wet/dry hybrid cooling system described above with the design parameters focused on reducing the visual plume. Such designs may also result in slightly less consumptive water use than mechanical draft cooling towers without plume abatement. The aesthetic impacts at the Lee Nuclear Station site with a mechanical draft cooling tower without plume abatement were determined to be SMALL; therefore, a mechanical draft tower with plume abatement offers no significant advantage. These towers often have a larger footprint and require additional energy to operate, resulting in a net loss of energy available to meet the demand for power. For these reasons, the review team concludes that the building and operation of mechanical draft cooling towers with plume abatement would not be an environmentally preferable alternative for the Lee Nuclear Station site.

9.4.2 Circulating-Water Systems

The review team also evaluated alternatives to the proposed intakes and discharges for the normal heat-sink cooling system, based on the proposed heat-dissipation system water requirements. The capacity requirements of the intake and discharge system are defined by the proposed heat-dissipation system. For proposed Lee Nuclear Station Units 1 and 2, the proposed heat-dissipation system is a closed-cycle system that uses mechanical draft cooling towers for heat dissipation.

As indicated in Table 3-10, the maximum makeup-water withdrawal for two AP1000 units at the site is 60,001 gpm (134 cfs). Duke considered two potential sources of makeup-water supply for the Lee Nuclear Station site: the Broad River and groundwater (Duke 2009c). In addition, Duke also considered water reuse in its NPDES permit application (Duke 2011a).

9.4.2.1 Intake Alternatives

The review team considered intake alternatives for taking water from the Broad River for ultimate use by the condenser cooling system. The proposed intake structure for Lee Nuclear Station Units 1 and 2 is described in detail in Section 3.2.2.2. Duke considered three alternatives for the intake system in addition to the proposed system: (1) intake structure on an intake canal, (2) perforated pipe intake structure, and (3) infiltration bed intake structure.

Intake Structure on an Intake Canal

Duke considered an intake structure on a canal. The intake structure would be located at the end of a 700-ft-long intake canal coming off the Broad River. A submerged weir would be located at the canal entrance to route streambed load past the canal entrance. The dimensions of the canal would be selected to maintain water velocity in the canal at less than 0.5 fps in compliance with the requirements of the Clean Water Act, Section 316(b). The low water velocity in the intake canal would allow some silt to settle before it reaches the intake structure, so the silt would need to be periodically removed from the canal during operation to maintain the initial dimensions. Use of an intake canal would provide better protection from floodwaters and result in a shorter piping system to Make-Up Pond A. The shorter piping system would result in lower pumping costs.

Building an intake structure at the end of an intake canal would require 4 ac of land and would disturb approximately 0.5 ac of river bottom. Use of an intake canal would also allow the intake structure and most of the canal to be built before the canal is connected to the river, resulting in no effect on the river during installation except while installing the weir at the entrance. When creating the opening at the mouth of the canal, the turbidity in the river would be increased for a short time. The impact on the river would be temporary and minor. Duke did mention, however, possible problems with river channel stability (Duke 2009c).

Perforated Pipe Intake Structure

A perforated pipe intake would draw water into the system through seven 36-in.-diameter pipes with 3/8-in. slotted openings located on the river bottom. Four 3-ft-diameter pipes would carry the water to pumps located in a concrete structure on land approximately 150 ft from shore. This design would result in through-opening intake velocities of less than 0.5 fps. The intake system would include piping to backwash the perforated pipe. The perforated pipe would be embedded in a concrete mat on the river bottom that would be anchored to bedrock. The concrete would protect the intake pipes from the effect of erosion and damage from large debris in the river. The river currents would carry both fish and debris past the openings in the perforated pipe. The frequency with which the perforated pipes would be backwashed would be determined by head loss as the slots became blocked by debris. Building the facility would require approximately 1 ac of land, and would disturb less than 0.5 ac of river bottom (Duke 2009c). A cofferdam would need to be constructed so that the anchor system, concrete mat, perforated pipe, and piping to the pump structure could be built in a dry setting.

Infiltration Bed Intake Structure

An infiltration bed intake structure would consist of a 100-ft-wide and 350-ft-long gravel infiltration bed with 6-in.-diameter perforated pipes on 42-in. centers embedded in the gravel to collect the water. Four 3-ft-diameter pipes would carry the water from the perforated pipes to pumps located in a concrete structure on land. The intake system would include piping to backwash the gravel infiltration bed.

A cofferdam would need to be constructed so that the gravel filter, perforated pipe, and piping to the pump structure could be built in a dry setting. An area of slightly less than 1 ac of the river bottom would be excavated to approximately 6 ft deep to allow construction of the infiltration bed. A cofferdam large enough to surround the construction area would result in increased water velocities in the river and likely cause scour of the river bottom adjacent to the cofferdam. These impacts would be expected to be temporary.

Intake velocities would be negligible, reducing the possibility of fish impingement. Backwashing the gravel bed would push entrapped sediment and debris back into the river current, allowing it to continue downstream. The frequency with which the gravel bed would need to be backwashed would be determined by head loss as the bed became loaded with debris. Frequent backwashing is anticipated, which would cause an increase in turbidity downstream of the gravel bed. In addition, river currents could scour the gravel bed leading to impaired performance.

Intake Alternatives Summary

The intake structure on an intake canal would require additional land disturbance relative to the proposed intake design and may have greater risk during operation due to river channel instability. The perforated pipe intake structure would require similar land disturbance to that of the proposed intake design and may have greater risk during operation due to damage of the pipe. Building an infiltration bed intake structure would disturb nearly 1 ac of river bed. In addition, a number of installation and operational considerations related to the infiltration bed limit the practicality of this alternative. The impacts associated with aquatic ecology for the proposed intake have been determined to be minor in Chapters 4 and 5. Therefore, the review team determines that there are no alternative intake designs that would be environmentally preferable to the proposed intake design for the Lee Nuclear Station site.

9.4.2.2 Discharge Alternatives

Duke proposes to discharge blowdown from Lee Nuclear Station Units 1 and 2 to the Broad River immediately behind Ninety-Nine Islands Dam. A detailed description of the proposed discharge system is presented in Section 3.2.2.2. Duke considered a single port spillway apron discharge, a bank-side single port discharge structure, and river bottom diffuser as alternatives to the proposed discharge diffuser.

Single Port Spillway Apron Discharge

The single port spillway apron discharge was rejected by Duke because Ninety-Nine Islands Dam is considered a historical site and the addition of the discharge structure to the apron spillway would unacceptably alter the appearance of the historical site. In addition, modeling of the thermal impacts of such a discharge indicates that this alternative would not meet State thermal requirements in the river below the spillway (Duke 2009c).

Single Port Pipe Discharge

A single port discharge structure located on the bank of the Broad River downstream of Ninety-Nine Islands Dam would consist of a single pipe anchored through a concrete headwall discharging into the river near the elevation of the surface of the river. Modeling of the thermal impacts of such a discharge indicates that State thermal requirements in the river would not be met with this discharge structure design (Duke 2009c).

River Bottom Single Port Diffuser

The installation of a river bottom single port diffuser would result in disturbance to the streambed (Duke 2009c). The operation of a river bottom single port diffuser would be affected by streambed disturbances, particularly during high flows.

Discharge Alternatives Summary

The single port apron spillway discharge alternative would alter the appearance of a historical site. Both the single port apron spillway and the single port pipe discharge alternatives would have limited mixing associated with the discharge design. The river bottom single port diffuser would result in disturbance to the river bottom during installation and would be subject to streambed disturbances during high flows. The review team determined that the impacts of operation of the proposed discharge system would be minor and that no alternative discharge designs would be environmentally preferable to the proposed discharge design at the Lee Nuclear Station site.

9.4.2.3 Water Supplies

The review team considered alternative sources for the CWS, including water reuse, groundwater, and surface water.

Water Reuse

Sources of water for reuse can come either from the plant itself or from other local water users. Sanitary wastewater-treatment plants are the most ubiquitous sources of water for reuse. Agricultural processing, industrial processing, and oilfield production can also provide significant supplies of water for reuse. Additional treatment (e.g., tertiary treatment, chlorination) may be required to provide water of appropriate quality for the specific plant need. The population density is low, and there is little industry around the Lee Nuclear Station site, so adequate reliable wastewater sources are not currently available. In Duke's NPDES application (Appendix J to Part VII of NPDES permit application [Duke 2011a]), a study of the feasibility of piping wastewater effluent from both the Gaffney Board of Public Works Wastewater Treatment plants to the proposed Make-Up Pond C was summarized. The pipeline would be required to extend over 10 mi. While this pipeline would reduce the withdrawals from the Broad River from the refill system, the review team determined, due to the small combined capacity of the wastewater-treatment plants that water reuse would not eliminate the need for either the refill intakes on the Broad River or Make-Up Pond C. Therefore, the review team determined that water reuse would not be an environmentally preferable alternative to Duke's proposed water supply and it was not evaluated further.

Groundwater

Groundwater is not considered a viable source of cooling water for Lee Nuclear Station Units 1 and 2 because the geologic formations in the vicinity of the site generally are not permeable enough to sustain the well yields required to support the condenser cooling-water makeup need (60,000 gpm) (Duke 2009c). Characterizations performed at the Lee Nuclear Station site support this assertion (see Chapter 2). The review team finds that the groundwater resource could not meet the cooling-water demands of proposed Lee Nuclear Station Units 1 and 2. Therefore, the review team determined that groundwater would not be a feasible alternative to Duke's proposed water supply.

Expansion of Make-Up Pond B

Duke (2009b, 2010k) evaluated expansion of Make-Up Pond B to provide an alternative supplemental water storage volume needed for Lee Nuclear Station Units 1 and 2. The 2010 evaluation was performed in the context of use in combination with a hybrid wet-dry cooling option. A significant volume of spoil material would need to be excavated and transported to a disposal site. The closest practical disposal site would be within the London Creek watershed and the proposed Make-Up Pond C area. Operation of the expanded Make-Up Pond B would not be able to comply with thermocline protection requirements of EPA's Section 316(b) of the Clean Water Act because there would not be sufficient volume to both meet the plant's needs and meet the thermocline protection requirements. Therefore, the review team determined, based on the impacts associated with excavation and disposal of spoil material during pond expansion, and the inability of the expanded Make-Up Pond B to comply with thermocline protection requirements, that expansion of Make-Up Pond B is not an environmentally preferable alternative.

9.4.2.4 Water Treatment

Both inflow and effluent water may require treatment to ensure that they meet plant water needs and effluent water standards. As described in Section 3.4.4, Duke proposes to add chemicals to plant water to meet appropriate water-quality process needs. The chemistry of effluent water is regulated by the EPA through the NPDES permitting process. The largest chemical inputs are required to maintain the appropriate chemistry in the cooling towers to preclude biofouling. The effluents from cooling-tower blowdown are specifically regulated in 40 CFR Part 423 by the EPA to protect the environment. The review team identified no environmentally preferable alternative to Duke's proposed chemical water treatment.

9.4.3 Summary of System Design Alternatives

The review team considered various alternative system designs, including seven alternative heat-dissipation systems and multiple alternative intake, discharge, and water-supply systems. The review team identified no alternatives environmentally preferable to the proposed Lee Nuclear Station plant systems design.

9.5 U.S. Army Corps of Engineers Alternatives Evaluation

The 404 Guidelines stipulate that no discharge of dredged or fill material into waters of the United States (including jurisdictional wetlands) shall be permitted if there is a practicable alternative that would have a less adverse impact on the aquatic environment, as long as the alternative does not have other significant adverse environmental consequences. An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes. If it is otherwise a practicable alternative, an area not presently owned by the applicant that could reasonably be obtained, used, expanded, or managed in order to fulfill the basic purpose of the proposed activity may be considered. Thus, this analysis is necessary to determine which alternative is the LEDPA that meets the project purpose and need. Even if an applicant's proposed alternative is determined to be the LEDPA, the USACE must still determine whether the LEDPA is contrary to the public interest. The USACE Public Interest Review, described in 33 CFR 320.4 (and further discussed in Appendix I), directs the USACE to consider the reasonably foreseeable benefits and detriments of the proposed project in light of a number of factors relevant to the public interest. A permit would not be issued for an alternative that is not the LEDPA, nor would a permit be issued for an activity that is determined to be contrary to the public interest.

9.5.1 Onsite Alternatives

As part of its process for evaluating permits, the USACE reviewed Duke's application and ER (Duke 2009b, c) for the proposed Lee Nuclear Station Units 1 and 2 project, responses to RAIs, data presented in this EIS regarding impacts on alternative sites, and Duke's information addressing onsite alternatives (i.e., alternative cooling-tower designs) for the Lee Nuclear Station site to minimize impacts on wetlands and other waters of the United States. Within this documentation, Duke provided a detailed description of the steps taken to minimize onsite impacts. According to information provided by Duke, the site layout with the least impact on waters of the United States for the proposed project is the Lee Nuclear Station site with 5.43 ac of wetland impacts, 29.63 ac of open-water impacts, and 67,285 linear ft of impacts on streams.

This EIS provides environmental information and analyses upon which the LEDPA determination will be based. It also considers public feedback received in the form of public comments on the draft EIS. Using this information as well as information in the applicant's Federal permit application, the USACE will address whether the LEDPA criterion is met in the Record of Decision.

9.5.2 Duke Alternative Sites

As noted previously, the evaluation and comparison of potential impacts on waters of the United States among the proposed and three alternative sites are limited by the use of reconnaissance-level data and the lack of detailed data for all but the Lee Nuclear Station site. The USACE issued Duke a jurisdictional determination on January 11, 2013, that identified 31.18 ac of wetlands,284.4 ac of open waters, and 167,071 linear ft of streams (based on field delineations) that are subject to Clean Water Act jurisdiction within the proposed project boundary, as well as 10.61 ac of non-jurisdictional open-water ponds (USACE 2013a). As described in Section 9.5.1 Onsite Alternatives, proposed impacts would affect a portion of these areas, including 5.43 ac of wetland impacts, 29.63 ac of open-water impacts, and 67,285 linear ft of impacts on streams. Waters of the United States were estimated for the Perkins, Keowee, and Middleton Shoals alternative sites using a combination of available data resources, including FWS National Wetlands Inventory mapping, U.S. Department of Agriculture–Natural Resources Conservation Service soils mapping, 2006 infrared aerial imagery, SCDHEC State Navigable Waters mapping, USGS 7.5-minute quadrangle maps, and the National Hydrography Dataset. For the alternative sites and their associated transmission-line corridors, acres of wetlands are given separately for forested and non-forested wetlands, as well as linear distance for streams. It is important to note that transmission-line routes associated with the three alternative sites are provisional and therefore would be subject to change. Note also that impacts on alternative sites include those areas that would be occupied by principal facilities such as the power block, cooling towers, and switchyard, as well as impacts resulting from intake and discharge water pipelines. In the absence of detailed topographic design data, it is not feasible to include impacts from associated fill slopes for these components or from other ancillary facilities on the alternative sites.

Table 9-19 presents the impacts on waters of the United States at the alternative sites based on reconnaissance-level information, and at the Lee Nuclear Station site based on field-delineated information. Table 9-19 includes impacts within each of the sites where nuclear facilities would be located, within associated cooling pond footprints, transmission-line corridors, railroad corridor, cooling-water pipelines, and roads.

9.5.3 Evaluation of the 404(b)(1) Guidelines

As part of its permit decision for the Lee Nuclear Station, the USACE must evaluate the compliance of the proposed project with the 404 Guidelines (40 CFR Part 230). This analysis will evaluate whether the discharge of dredged or fill material will cause or contribute to significant degradation of the waters of the United States. Findings with respect to the potential for significant degradation are based upon factual determinations, evaluations, and tests required by Subparts B and G of the 404 Guidelines, after consideration of information required by Subparts C through F of the 404 Guidelines. This evaluation addresses the impacts associated with placement of dredged or fill material into waters of the United States, including special aquatic sites. Note that this evaluation does not evaluate the discharge of water from the outfall pipe itself during normal operations of the Lee Nuclear Station pursuant to Section 402 of the Clean Water Act (CWA) or effects from the operation of intake structures in accordance with Section316(b) of the CWA.

Table 9-19. Comparison of Impacts on Waters of the United States for the Proposed and Three Alternative Sites

	Perkins Site[(a)]	Keowee Site[(a)]	Middleton Shoals Site[(a)]	Lee Nuclear Station[(b)] (Proposed)
Nuclear Station Sites and Supplemental Cooling–Water Reservoirs				
Wetland impacts (ac)	92.5	22.5	175.2	3.55
Stream impacts (linear ft)	207,000	144,000	378,000	65,795
Open water impacts (ac)	2.4	12.3	37	29.63
Total wetland and open-water impacts (ac)	94.9	34.8	212.2	33.18
Transmission Corridors, Railroad Corridor, Cooling-Water Pipelines, Roads				
Wetland impacts (clearing forest, ac)[(a)]	24	3	4.2	1.88[(c)]
Stream impacts (linear ft)[(a)]	15,000	5000	24,000	1490
Open water impacts (ac)	0.2	2.8	19	0
Total wetland and open-water impacts (ac)	24.2	5.8	23.2	1.88
Grand Total – wetland and open-water impacts (ac)	119.1	40.6	235.4	35.06
Grand Total – stream impacts (linear ft)	222,000	149,000	402,000	67,285

Source: Duke 2010g, 2012n

(a) Impacts on wetlands and other waters of the United States for the Perkins, Keowee, and Middleton Shoals alternative sites are based on published mapping data, including but not limited to National Wetlands Inventory mapping and other available information sources described in the text.

(b) Impacts on wetlands and other U.S. waters of the United States for the Lee Nuclear Station Site alternative (proposed action) are based on field delineations.

(c) Includes 0.21 acres of forest clearing in wetlands located on the Lee Nuclear Station site, as noted in Table 2-20.

The proposed construction of Lee Nuclear Station and required ancillary features, such as Make-Up Pond C (also known as Drought Contingency Pond C), transmission lines, and the railway corridor will affect 67,285 ft (12.74 mi) of stream, 5.43 ac of wetlands, and 29.63 ac of open waters. Table 9-20 summarizes the impacts on waters of the United States according to major project element and impact activity. Compensatory mitigation will be provided for all unavoidable wetland, stream, and open-water impacts as wetland and stream mitigation per the 2008 Mitigation Rule as implemented by the USACE Charleston District Guidelines for Preparing a Compensatory Mitigation Plan (USACE 2010). The following sections discuss the aquatic resources that will be affected by the proposed project to provide a context of impacts pursuant to the 404 Guidelines.

Table 9-20. Summary of Impacts on Waters of the United States

		Open-Water Impacts (ac)					
		Perm Fill	**Temp Fill**	**Perm Dredging**	**Perm Flooding**	**Temp Drain**	**TOTAL**
Broad River (Ninety-Nine Islands Reservoir)	Intake Structure	0.06		0.48			0.54
	Diffuser		0.04	1.00		0.15	1.19
Make-Up Pond A	Intake Structure	0.22	0.20	1.06		1.08	2.56
	Refill Structure	0.07				0.48	0.55
	Cofferdam Dredging			2.70			2.70
	Outcrop Dredging			0.56			0.56
Make-Up Pond B	Intake/Refill Structure	1.07	0.43			0.09	1.59
	Refill Structure	0.06	0.08			0.13	0.27
	Cofferdam Dredging			2.09			2.09
Make-Up Pond C	Lake Cherokee Dam and Spillway	0.02					0.02
	Impoundment				0.03		0.03
	Farm Pond Draining					17.53	17.53
Subtotals		1.50	0.75	7.89	0.03	19.46	
TOTAL							**29.63**

		Stream Impacts (linear ft)						**TOTAL**
		Perm Fill	**Temp Fill**	**Perm Excavation**	**Perm Flooding**	**Temp Flood**	**Temp Clearing**	
Make-Up Pond C	Intake/Refill Structure	98						98
	Dam and Toe Drain	1855		267				2122
	Dam Excavation Spoil	730						730
	Saddle Dikes	74						74
	Spillway/Stilling Basin Armoring	636						636
	SC 329 Relocation	396						396
	Construction Roads	223						223
	Lake Cherokee Dam and Spillway	218						218
	Impoundment				60,414			60,414
	50-ft Buffer Clearing						884	884
Railroad Corridor	Culvert Replacement	145	25			1320		1490
Subtotals		4375	25	267	60,414	1320	884	
TOTAL								**67,285**

Table 9-20.(contd)

		Wetland Impacts (ac)					TOTAL
		Perm Fill	Temp Fill	Perm Flooding	Temp Flood	Perm Clearing	
Make-Up Pond C	Dam	0.04					0.04
	Dam Excavation Spoil	0.24					0.24
	SC 329 Relocation	0.01					0.01
	Construction Roads		0.04				0.04
	Impoundment			3.22			3.22
Railroad Corridor	Culvert Replacement	0.11	0.06		0.35		0.52
Transmission Lines (includes 0.21 ac of forest clearing in wetlands located on the Lee Nuclear Station site)	Forested Clearing					1.36	1.36
Subtotals		0.40	0.10	3.22	0.35	1.36	
TOTAL							**5.43**

Perm = Permanent; Temp = Temporary

9.5.3.1 Potential Effects on Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C)

40 CFR 230.20 Substrate

The substrate of the aquatic ecosystem underlies open waters of the United States and constitutes the surface of wetlands. It consists of organic and inorganic solid materials and includes water and other liquids or gases that fill the interstices between solid particles. The discharge of fill material resulting from this project will eliminate or alter the substrate material and/or depth of the waters of the United States at the disposal sites.

Direct Impacts

Intake/Refill Structures: The placement of fill material and a concrete structure for the construction of the Broad River intake will result in permanent loss of 0.06 ac of substrate in the Ninety-Nine Islands Reservoir (Table 9-20). A temporary cofferdam will be used during the river intake construction; however, upon intake construction completion, all temporary cofferdam fill locations will be removed and the substrate ultimately dredged, constituting the permanent impact. Dredging associated with the construction of the river intake structure will lower the elevation of 0.48 ac (Table 9-20) of substrate in Ninety-Nine Islands Reservoir adjacent to the structure an average of 8.5 ft below the existing grade.

The placement of fill and a concrete structure for the construction of the Make-Up Pond A (also known as Sedimentation Pond A) intake structure will result in the permanent loss of 0.22 ac of substrate in Make-Up Pond A, while the placement of the cofferdam will result in the temporary loss of 0.20 ac of substrate. The cofferdam will be removed upon completion of intake construction. Dredging associated with the construction of the Make-Up Pond A intake will result in lowering of the bottom elevation of 1.06 ac of substrate in Make-Up Pond A an average of 21 ft below the existing grade. The placement of fill and a concrete structure for the construction of the Make-Up Pond A refill structure will result in the loss of 0.07 ac of substrate in Make-Up Pond A (Table 9-20).

The construction of the Make-Up Pond B (also known as Drought Contingency Pond B) intake/refill structure will result in the permanent loss of 1.07 ac of substrate and 0.43 ac of temporary fill in Make-Up Pond B. The Make-Up Pond B intake/refill structure will result in permanent impact of 0.06 ac of substrate and 0.08 ac of temporary fill in Make-Up Pond B. In addition to the impacts mentioned above, the cofferdam used to construct the Make-Up Pond B intake/refill structure will require the dredging of 2.09 ac in Make-Up Pond B (Table 9-20) to an approximated average of 20 ft below existing grade over the 2.09-ac area to be dredged.

The construction of the Make-Up Pond C intake/refill structure (also known as the Make-Up Pond C intake/discharge structure) will result in the placement of a concrete structure in 98 ft of London Creek (Table 9-20). Sections of London Creek upstream and downstream of this location will ultimately be impounded, constituting a secondary impact.

<u>Diffuser Structure</u>: The diffuser will be attached to the face of the Ninety-Nine Islands Dam; therefore, there will be no permanent placement of fill from this activity. The construction of the diffuser structure will involve the placement of a temporary cofferdam near the bank of the Ninety-Nine Islands Reservoir. This activity will result in the temporary placement of fill within 0.04 ac of substrate within the Ninety-Nine Islands Reservoir. Dredging associated with the installation of the diffuser and at the forebay of the dam will result in 1.00 ac of impact on the substrate of Ninety-Nine Islands Reservoir (Table 9-20).

<u>Make-Up Pond A Bottom Dredging</u>: In addition to the dredging associated with the structures described above, the existing cofferdams and soil outcrops in Make-Up Pond A will be removed by dredging. These artificial features were created during the construction activities of the Cherokee Nuclear Station. A total of 3.26 ac of Make-Up Pond A substrate will be dredged (Table 9-20).

<u>Make-Up Pond C Dam Infrastructure</u>: Fill material for the construction of the dam and toe drain for Make-Up Pond C will affect 0.04 ac of wetland and 1855 linear ft of stream (Table 9-20). Fill material associated with the construction of the saddle dikes will fill 74 linear ft of stream. These fill activities will eliminate the substrate of these waters of the United States. The construction of the spillway, stilling basin, and placement of riprap will result in armoring, via fill placement,

within 636 linear ft of stream habitat (Table 9-20). The placement of this material will permanently change the substrate of the aquatic resource from natural sand, gravel, and cobble to riprap and concrete.

<u>50-Ft-Wide Make-Up Pond C Buffer</u>: The mechanical clearing of 884 linear ft of stream (Table 9-20) and less than 0.01 ac of wetland may result in impacts on the substrate of these aquatic resources due to potential disturbance from tires and treads from the equipment and grubbing operations.

<u>Borrow Excavation</u>: The excavation of material for the construction of the Make-Up Pond C dam and toe drain will result in the elimination of substrate for 267 linear ft of stream (Table 9-20). This area will ultimately be inundated by the impoundment of Make-Up Pond C and a new reservoir substrate will form.

<u>SC 329 and Construction Roads</u>: The relocation of SC 329 will result in the construction of culverts, affecting 396 linear ft of stream (Table 9-20). Culverts represent fill and will completely replace, with a hard substrate, the natural stream bottom habitat of these stream sections. While culvert bottoms will accumulate sediments over time, with exception of aquatic organism passage, aquatic functions are considered lost. The placement of fill associated with SC 329 relocation will permanently affect 0.01 ac of wetland substrates. Roads required for the construction of Make-Up Pond C will result in the permanent placement of culverts and fill material within 223 linear ft of stream substrate, and temporary placement of fill within 0.04 ac of wetlands (Table 9-20). These roads will ultimately be inundated by the construction of Make-Up Pond C, and a new aquatic substrate will form.

<u>Lake Cherokee Dam and Spillway</u>: The placement of riprap to stabilize the embankment of the Lake Cherokee Dam will permanently affect 218 linear ft of stream substrate and 0.02 ac of open water (Table 9-20). The riprapped embankment will ultimately be inundated by Make-Up Pond C.

<u>Spoil Areas</u>: Spoil excavated during the construction of the dam for Make-Up Pond C will be stockpiled onsite. The construction design maximizes the use of upland areas for spoil disposal; however, the quantity of the material requires unavoidable impact on some waters of the United States for adequate spoil storage. A majority of the spoil material will be placed in the location of the farm ponds, including within low-quality fringe wetlands around the pond margins. The placement of this material will result in permanent impact on730 linear ft of stream substrate and 0.24 ac of wetland substrates (Table 9-20).

<u>Railroad Culvert Replacement</u>: Two existing, undersized 120-in.-diameter culverts with associated scour downstream of the railroad crossing with London Creek must be replaced. This work will result in the placement of fill material within 145 linear ft of London Creek, 140 linear ft of which will be new culvert, and placement of permanent fill within 0.11 ac of

wetlands. Construction cofferdams, which constitute fill, will temporarily affect 25 linear ft of London Creek and 0.06 ac of wetland (Table 9-20). Temporary impacts on the substrate will be restored to preconstruction conditions after removal of the cofferdam.

Secondary Effects

Draining from Temporary Cofferdams: Use of temporary cofferdams during construction of the intake/refill structures in Make-Up Ponds A and B and the diffuser will temporarily remove water behind the cofferdams during construction. This will cause 1.93 ac of open water to be temporarily drained (Table 9-20). Additional area behind the cofferdams will be drained during construction; however, these areas will ultimately experience other substrate impacts (e.g., dredging or placement of riprap for stabilization), which were previously discussed inapplicable direct impacts sections. Temporary draining behind the cofferdams will have minimal adverse effects on the aquatic substrate within these localized areas. The substrate would not serve as aquatic habitat during construction; however, upon completion of construction and removal of the cofferdams, the drained aquatic substrate would be re-inundated and should revert to providing aquatic functions.

Impoundment of Make-Up Pond C: The impoundment of Make-Up Pond C would convert 60,414 linear ft of streams, 3.22 ac of wetlands, and 0.03 ac of open-water habitat to deep open water (Table 9-20). The substrate would no longer provide the function of the original habitat, but would provide a different function as substrate for a reservoir. In most instances, substrate within the new impoundment would be a deepwater habitat with potentially lower dissolved oxygen content in the vicinity of the substrate. This, along with the lentic conditions of the impoundment, will lead to a different community of benthic macroinvertebrates inhabiting the substrate. The presence of the dam may also affect the substrate of London Creek downstream of the dam, principally by increased fluvial erosion due to diminished sediment loading.

Draining of Farm Ponds: Draining the farm ponds on the Make-Up Pond C site will result in impacts on 17.53 ac of open-water habitat (Table 9-20). Spoil material associated with the excavation for the Make-Up Pond C dam will be placed in some of the drained open-water habitat, while other drained open-water habitat will ultimately be inundated by Make-Up Pond C. Spoil placement will result in the elimination of the aquatic substrate, while aquatic substrate will redevelop within drained farm ponds that will be inundated by Make-Up Pond C.

Transmission Lines: A total of 1.36 ac of forested wetland will be hand-cleared on the Lee Nuclear Station site and for the transmission lines (Table 9-20). No impact on the substrate of these wetlands is expected.

Railroad Culvert Replacement: If a 10-year storm event occurs during construction, 1320 linear ft of stream and 0.35 ac of wetland may be temporarily flooded during the railroad culvert replacement due to water impounding from the cofferdams (Table 9-20). Temporary flooding of these resources would have a minimal adverse effect on the substrate.

40 CFR 230.21 Suspended Particulates/Turbidity

Suspended particulates in the aquatic ecosystem consist of fine-grained mineral particles, usually smaller than silt, and organic particles. Suspended particulates may enter waterbodies as a result of sheet flow runoff, flooding, vegetative and planktonic breakdown, resuspension of bottom sediments, and human activities including dredging and filling activities. Particulates may remain suspended in the water column for variable periods because of agitation of the water mass and particle, physical, and chemical properties of particle surfaces. Aquatic areas of protracted high turbidity and suspended particulates may incur reduced light penetration and a lower rate of photosynthesis and primary productivity. Sight-dependent species may suffer reduced feeding ability, leading to limited growth and lowered resistance to disease if high levels of suspended particulates persist. The biological and chemical content of the suspended material may react with dissolved oxygen in the water and result in oxygen depletion; however, only a localized effect would be likely, given the small areas of impact and short duration of construction. Toxic metals and organic elements, pathogens, and viruses absorbed by or adsorbed to fine-grained particulates may become biologically available to organisms either in the water column or on the substrate. Significant increases in suspended particulate levels create turbid plumes that are highly visible and aesthetically displeasing. The spatial extent and persistence of these adverse impacts are influenced by numerous inter-related conditions, including the increase in suspended particulates above naturally occurring levels; duration of the higher levels; current patterns, water levels and fluctuations when discharges occur; volume, rate, and duration of the discharge; particulate deposition rate; and the seasonal timing of the discharge.

Direct Impacts

Intake/Refill Structures: Fill used to construct the intake and refill structures will be placed behind temporary cofferdams, thereby limiting the dispersal of particulates into the water column. Dredging associated with the intake/refill structures may lead to minor temporary increases in turbidity and suspended particulates.

Diffuser Structure: Excavation into the bank of the Ninety-Nine Islands Reservoir during diffuser structure installation will occur behind a temporary cofferdam, limiting the potential for turbidity during this activity. Dredging of the Ninety-Nine Islands Dam forebay to improve diffuser operation may lead to temporary, minor increases in turbidity.

Make-Up Pond A and Make-Up Pond B: Minor increases in turbidity will occur during the dredging of existing cofferdams and soil outcrops present within Make-Up Pond A and Make-Up Pond B. According to the applicant, and by permit conditions to be included in any Department of the Army permit that may be issued, BMPs, including the use of turbidity curtains, would be used to contain the effects of increased turbidity during dredging.

Make-Up Pond C Dam Infrastructure: The placement of fill material for the dam for Make-Up Pond C will occur when flow from London Creek is diverted using pumps. Cofferdams would be placed upstream and downstream of the proposed dam construction. Placing fill during dry conditions would limit the potential for suspended particulates and turbidity to enter the London Creek system downstream of the dam. Fill material placed in wetland areas will not result in suspended particulates in the water column.

50-Ft-Wide Make-Up Pond C Buffer: Mechanical clearing and grubbing of the 50-ft-wide buffer around Make-Up Pond C may result in minor amounts of turbidity within tributaries to London Creek.

Borrow Excavation: The excavation of material for the construction of the Make-Up Pond C dam and saddle dikes may result in localized turbidity within tributaries to London Creek.

SC 329 and Construction Roads: Construction of the culverts associated with the relocation of SC 329 and the construction roads will occur during dry conditions, and thus will limit the potential for turbidity in the aquatic ecosystem.

Lake Cherokee Dam and Spillway: The placement of riprap and associated grading to stabilize the embankment of the Lake Cherokee dam may temporarily increase turbidity within London Creek. The work on the emergency spillway for Lake Cherokee could result in localized and temporary turbidity conditions at the site of the work.

Spoil Areas: Spoil material placed in streams has the potential to contribute to temporary increases in turbidity in the subject streams.

Railroad Culvert Replacement: The replacement of the culvert at the railroad crossing of London Creek would occur when flow from London Creek is diverted around the work using pumps. Cofferdams would be placed upstream and downstream of the proposed work. Placing the fill during dry conditions would limit the potential for suspended particulates and turbidity to enter the London Creek ecosystem downstream of the culvert. The improved capacity of the new culvert will reduce downstream scour and limit turbidity during high-flow events.

Secondary Effects

Draining from Temporary Cofferdams: Draining behind the temporary cofferdams used to construct the intake, refill, and diffuser structures may contribute to temporary and localized increases in turbidity while water is pumped from behind the cofferdams. Pumps running to remove accumulated water behind the cofferdams from rainfall and leakage during construction may contribute to additional temporary and localized increases in turbidity.

Impoundment of Make-Up Pond C: The impoundment of London Creek would reduce the magnitude and duration of flood flows and interrupt downstream sediment and nutrient delivery. Long-term reduction in sediment load would affect channel formation and nutrient-cycling dynamics. This could result in fluvial erosion downstream of the dam because the sediment load may not be sufficient to replace sediment loss during higher flows. Sediment transport in the London Creek system has already been altered due to the presence of Lake Cherokee and several farm ponds on tributaries. Likewise, the presence of the Ninety-Nine Islands Dam on the Broad River approximately 1 mi downstream of the confluence of London Creek currently restricts sediment transport further downstream in the river. Because Make-Up Pond C will be constructed between these existing reservoirs, the effect on sediment transport in the Broad River system would be minor.

Draining of Farm Ponds: Draining the farm ponds may temporarily increase turbidity in tributaries to London Creek. Upon completion of pumping operations and dam removal, additional turbidity effects are not expected.

Transmission Lines: Because forested wetlands and riparian buffers will be hand-cleared within the transmission-line rights-of-way and disturbance to the soil is not expected, no increases in turbidity would occur.

Railroad Culvert Replacement: According to the applicant, if a 10-year storm event occurs during construction, temporary flooding may occur to portions of London Creek and adjacent wetlands due to the temporary cofferdam, which could lead to deposition of suspended particulates as the floodwaters recede. If these effects occur, they would be minor and localized.

40 CFR 230.22 Water

Water is the part of the aquatic ecosystem in which organic and inorganic constituents are dissolved and suspended. It constitutes part of the liquid phase of the substrate and is contained in its interstices. Water forms part of a dynamic aquatic life-supporting system. Water clarity; nutrient, chemical, physical, and biological content; dissolved gas levels; pH; and temperature contribute to its life-sustaining capabilities. The addition of contaminants during construction may temporarily reduce or eliminate the suitability of waterbodies for populations of aquatic organisms, and for human consumption, recreation, and aesthetics. The discharge of nutrients or organic material to the water column may lead to a high biochemical oxygen demand (BOD), which in turn may lead to reduced dissolved oxygen, thereby potentially affecting the survival of many aquatic organisms. Increases in nutrients may favor one group of organisms (e.g., algae) to the detriment of other, more desirable groups (e.g., submerged aquatic vegetation), potentially causing adverse health effects, objectionable tastes and odors, and other problems.

Direct Impacts

The placement of fill associated with intake structures, refill structures, the diffuser, Make-Up Pond C dam and associated infrastructure, SC 329, construction roads, the railroad culvert, and spoil areas may lead to temporary and minor changes in the clarity, color, odor, and taste of water within the vicinity of the work. Nutrients adhering to fill particles could lead to minor and localized increases in nutrient levels and BOD; however, BMPs, including erosion and sediment control, would minimize this potential. Likewise, the mechanical clearing of the 50-ft-wide Make-Up Pond C buffer; borrow excavation; and dredging at the intake, refill, diffuser structures, and existing cofferdams in Make-Up Pond A and Make-Up Pond B may lead to similar changes. However, these construction activities will be brief, and the area of impacts will be relatively small. Thus, the described work is not expected to result in more than minimal effects on water.

Secondary Effects

Draining from Temporary Cofferdams: The temporary cofferdams at the intake, refill, and diffuser structures will temporarily eliminate the water environment behind the cofferdams during construction of the structures. The water environment in these localized areas will return to preconstruction conditions upon removal of the cofferdams.

Impoundment of Make-Up Pond C: Changes in water temperature would be expected to result from the conversion of the London Creek ecosystem from a lotic system with associated vegetated wetlands to a large open-water reservoir. Temperature influences the chemical properties of natural waterbodies (e.g., amount of dissolved oxygen), which in turn can limit the ability of certain plants and animals to use these waterbodies. Impoundments may act as nutrient sinks, which could lead to increased BOD within deep areas of Make-Up Pond C. Clearing and grubbing of vegetation within the impoundment footprint prior to inundation will minimize the potential for significant increases in BOD after initial inundation. Impoundments do not seem to significantly affect the pH of a receiving stream (TDEC 2006). Approximately 0.6 mi of London Creek will remain between the proposed Make-Up Pond C dam and the confluence with the impounded waters of the Ninety-Nine Islands Reservoir. This segment of London Creek will likely experience less nutrient input after dam construction. The presence of Lake Cherokee on the headwaters of London Creek and several farm ponds on tributaries may already contribute to reduced nutrient levels in London Creek. Therefore, creation of Make-Up Pond C between Lake Cherokee and Ninety-Nine Islands Reservoir is not likely to contribute more than minor impacts on nutrient levels within the remaining 0.6-mi segment of London Creek or to the Broad River system. Lateral seepage from Make-Up Pond C due to the rise in the water table could increase water levels in some nearby private wells. As discussed in

Section 5.2.3, some temporary increases in turbidity may occur within private wells during the initial filling of Make-Up Pond C, but impacts on groundwater quality would be minor.

Draining of Farm Ponds: The draining of the farm ponds will eliminate the open water at these locations. Some of the farm pond areas will ultimately be re-inundated by the impoundment of Make-Up Pond C, while others will ultimately be the site of spoil stockpiles.

Transmission Lines: Hand-clearing forested wetlands and stream buffers within the transmission-line rights-of-way may cause localized increases in temperature within streams due to the loss of some canopy trees. The presence of shrub vegetation should minimize some of the increase in temperature.

Railroad Culvert Replacement: Potential flooding of short segments of London Creek and adjacent wetlands during the railroad culvert replacement is not expected to affect the chemical or biological content of the water environment.

40 CFR 230.23 Current Patterns and Water Circulation

Current patterns and water circulation are the physical movements of water in the aquatic ecosystem. Currents and circulation respond to natural forces as modified by basin shape and cover, physical and chemical characteristics of water strata and masses, and energy-dissipating factors. The discharge of dredged or fill material may modify current patterns and water circulation by obstructing flow, changing the direction or velocity of water flow and circulation, or otherwise changing the dimensions of a waterbody. As a result, adverse changes may occur in the location, structure, and dynamics of aquatic communities; shoreline and substrate erosion and deposition rates; deposition of suspended particulates; rate and extent of mixing of dissolved and suspended components of the waterbody; and water stratification.

Direct Impacts

Virtually all changes in current patterns and water circulation related to the discharge of fill material will occur as secondary impacts, as explained below.

Secondary Effects

Intake/Refill Structures: The construction of the river intake structure is expected to have minor effects on current patterns and water circulation. During construction, the cofferdam will extend into the Ninety-Nine Islands Reservoir, partially obstructing flow. Some minor scour and bank erosion may occur due to the increased flow velocity. Once the cofferdam is removed, flow is expected to return to preconstruction conditions and any area affected by scour is expected to rehabilitate naturally. The presence of the intake structure is not expected to substantially affect shoreline erosion and accretion patterns. The river intake structure will be nearly flush with the bank of the Ninety-Nine Islands Reservoir in a position where erosion to the bank will be minimized. Intake/refill structures within Make-Up Pond A, Make-Up Pond B, and Make-Up Pond C are not expected to directly affect current patterns or water circulation. Effects on current patterns and water circulation due to the operation of these structures will also be addressed in the NPDES permit for the Lee Nuclear Station under Section 316(b) of the CWA.

Diffuser Structure: Because the diffuser will be attached to the dam, it is not expected to affect current patterns or water circulation. Dredging in the forebay in front of the Ninety-Nine Islands Dam is expected to facilitate mixing from the blowdown discharge and will improve water circulation.

Make-Up Pond A and Make-Up Pond B Dredging: The removal of existing cofferdams and soil outcrops in Make-Up Pond A and Make-Up Pond B is not expected to negatively affect water-circulation patterns within these artificial impoundments. By restoring the natural contours of the area, water circulation may improve within these bodies of water.

Impoundment of Make-Up Pond C: Make-Up Pond C would impound the London Creek system, including headwater drainages, and would alter the water-circulation patterns upstream and downstream of the dam. The presence of Lake Cherokee on London Creek and farm ponds on several headwater tributaries has already altered the existing hydrology of the system to some degree. The impoundment of London Creek will change the drainage from a lotic to a lentic environment upstream of the dam. Approximately 0.6 mi of London Creek will remain between the toe of the dam and the confluence with the Ninety-Nine Islands Reservoir. During operation, London Creek downstream of the dam would continue to receive flow through seepage from the dam, flow down the spillway, and local tributaries (e.g., Little London Creek). Subject to special conditions (to be included in any permit that may be issued) flow commensurate with at least seasonal minimum flow volume will be maintained during construction and while the impoundment is being filled. The net reduction in discharge below the dam would represent restricted stream flows and would affect the downstream transfer of sediments and detritus. However, the transport of these sediments and detritus would likely occur during high flows in the Ninety-Nine Islands Reservoir and the subsequent backwater effect within the London Creek channel. The presence of the existing Ninety-Nine Islands Dam restricts the further transport of such material further downstream within the Broad River system.

50-Ft-Wide Make-Up Pond C Buffer: The mechanical clearing of wetlands and tributaries is not expected to affect current patterns or water circulation.

Borrow Excavation: The excavation of borrow material for the Make-Up Pond C dam may affect the flows of one London Creek tributary, which will ultimately be inundated by Make-Up Pond C. Such long-term impacts are described in the discussion of the effects of the impoundment of Make-Up Pond C.

SC 329 and Construction Roads: Culverts placed during the relocation of SC 329 may alter the flows of tributaries to London Creek. Culverts are already present at these locations for the existing SC 329 and the culverts have been sized to pass adequate flows according to South Carolina Department of Transportation (SCDOT) standards; therefore, no significant impacts on flows are expected. It is possible that temporary culverts placed in tributaries to London Creek for Make-Up Pond C construction roads may temporarily alter the flows of these streams; however, these roads will ultimately be inundated by Make-Up Pond C. Such long-term impacts are described in the discussion of the effects of the impoundment of Make-Up Pond C.

Lake Cherokee Dam and Spillway: Improvements to the Lake Cherokee Dam and emergency spillway are not expected to affect current patterns or water circulation.

Railroad Culvert Replacement: The existing culvert at the railroad crossing of London Creek will be enlarged to a four-cell culvert to improve its capacity. This will reduce temporary inundation on the upstream side of the culvert and high velocities on the downstream side during high flows. During high flood events, backwater from the Broad River stages to a point on London Creek upstream of the culvert. The enlarged capacity will allow more water to pass upstream of the culvert during flooding on the Broad River, and one cell of the culvert will be constructed with engineered streambed material to provide a more natural channel for passage of fish and other aquatic organisms. This culvert replacement will have a beneficial effect on current patterns and water circulation over existing conditions.

Draining from Temporary Cofferdams: The temporary cofferdams associated with the construction of the intake, refill, and diffuser structures will temporarily eliminate the existing water circulation within the area behind the cofferdams. Once the cofferdams are removed, water circulation will be restored.

Draining of Farm Ponds: Draining of farm ponds within the project area will eliminate the existing water circulation within these bodies of open water. Some of these farm ponds will ultimately be inundated by Make-Up Pond C and will be subject to new water-circulation patterns, while other farm ponds will be the sites of spoil material deposition and will cease to function as aquatic systems.

Transmission Lines: Hand-clearing of shrubs and trees within wetlands and riparian buffers within the transmission-line rights-of-way will have no effect on current patterns or water circulation.

Summary: Impacts on current patterns and water circulation will occur primarily as secondary effects. Most components of Lee Nuclear Station will have minor impacts on current patterns and water circulation. The construction of Make-Up Pond C will alter the water-circulation patterns upstream and downstream of the Make-Up Pond C dam. London Creek does not contribute significant volume to the flow of the Broad River and would therefore not significantly affect current patterns or water circulation within the Broad River system. The railroad culvert enlargement will have a beneficial effect on water circulation and flow over current conditions at the railroad crossing of London Creek.

40 CFR 230.24 Normal Water Fluctuations

Normal water fluctuations in a natural aquatic system consist of daily, seasonal, and annual tidal and flood fluctuations in water level. Biological and physical components of such a system are either attuned to or characterized by these periodic water fluctuations.

Direct Impacts

Virtually all changes in water fluctuations related to the discharge of fill material will occur as secondary effects, as explained below.

Secondary Effects

Intake/Refill Structures: The intake/refill structures within Make-Up Pond A, Make-Up Pond B, and Make-Up Pond C will be operated for the purpose of moving water to meet the needs of proposed Lee Nuclear Station Units 1 and 2. Operating the intake/refill structures within Make-Up Pond A would have minimal effect on water levels in that reservoir (see Section 5.3.1.1). However, operating the intake/refill structures within Make-Up Pond B and Make-Up Pond C during drought periods could cause substantial drawdowns of water levels within those reservoirs that could be seasonal in duration. Such drawdowns and their potential effects on abutting wetlands are discussed in Section 5.3.1.1. Such drawdowns and their potential effects on aquatic resources are discussed in Section 5.3.2.1. The operation of the intake/refill structures is detailed in the water-management plan for Lee Nuclear Station (Duke 2011a). The operation of the intakes is regulated under section 316(b) of the CWA.

Diffuser Structure: The diffuser structure is not expected to affect water fluctuations in the Broad River system.

Make-Up Pond A and Make-Up Pond B Dredging: Dredging the existing cofferdams and soil outcrops in Make-Up Pond A and Make-Up Pond B is not expected to affect normal water fluctuations within these impoundments.

Make-Up Pond A and Make-Up Pond B Construction Drawdown: Make-Up Pond A and Make-Up Pond B will be drawn down 20 ft for approximately 32 and 34 months, respectively, during construction of the intake/refill structures and associated cofferdams. During that time, the area of Make-Up Pond A and Make-Up Pond B will be reduced by 28 and 64 ac, respectively (Duke 2012o). Such drawdowns and their potential effects on abutting wetlands are discussed in Section 4.3.1.1. Such drawdowns and their potential effects on aquatic resources are discussed in Section 4.3.2.1.

50-Ft-Wide Make-Up Pond C Buffer: Mechanical clearing of wetlands and streams is not expected to affect normal water fluctuations.

SC 329 and Construction Roads: Culverts placed during the relocation of SC 329 may affect the normal water fluctuation of tributaries to London Creek. Culverts are already present at these locations for the existing SC 329, have been sized to pass adequate flows according to SCDOT standards, and will be countersunk to pass low flows; therefore, no substantial impacts on flows are expected. Temporary culverts placed in tributaries to London Creek for Make-Up Pond C construction roads may alter the natural water fluctuation of these streams; however, these roads will ultimately be inundated by Make-Up Pond C. Long-term impacts of Make-Up Pond C are described in Sections4.2 and 5.2.

Lake Cherokee Dam and Spillway: Improvements to the Lake Cherokee dam and emergency spillway are not expected to affect normal water fluctuations.

Railroad Culvert Replacement: The existing culvert at the railroad crossing of London Creek will be enlarged to improve its capacity. This will reduce temporary inundation on the upstream side of the culvert and help restore more natural water-level fluctuations at this point of the stream. During high flood events, backwater from the Broad River stages to a point on London Creek upstream of the culvert. In addition, the enlarged capacity will allow more water to pass upstream of the culvert during flooding on the Broad River and one cell of the culvert will be constructed with engineered streambed material to provide a more natural channel for passage of fish and other aquatic organisms. This replacement will have a beneficial effect compared to existing conditions.

Draining from Temporary Cofferdams: The temporary cofferdams used to construct the intake, refill, and diffuser structures will temporarily eliminate normal water fluctuations within the area behind the cofferdams. Normal water fluctuation will return once the cofferdams are removed.

Impoundment of Make-Up Pond C: Make-Up Pond C would impound 60,414 linear ft of stream and would reduce the downstream flow of London Creek. The flow pattern of and water fluctuations within London Creek would be permanently altered. London Creek may experience less frequent overbank flood events downstream of the proposed dam, but the remaining segment of London Creek would still receive floodwaters from the backwater effect of the Broad River. Few wetlands downstream of the proposed dam derive their hydrology from overbank flooding from London Creek flows. Floodplain wetlands downstream of the railroad crossing adjacent to London Creek likely derive most of their hydrology from the backwater effects associated with Ninety-Nine Islands Reservoir during flood events. Other wetlands downstream of the dam are associated with Little London Creek, which will not be affected by the impoundment.

Draining of Farm Ponds: Draining the farm ponds will eliminate existing normal water fluctuations within these artificial bodies of water. Some of these farm pond areas will ultimately be re-inundated by Make-Up Pond C, while others will ultimately be the sites of excess spoil disposal.

Transmission Lines: Hand-clearing trees and shrubs within forested wetlands and riparian buffers within the transmission-line rights-of-way will not affect normal water fluctuations.

40 CFR 230.25 Salinity Gradients

Salinity gradients occur where saltwater from the ocean meets and mixes with freshwater from land. This project is located inland and saline habitats will have no effect on salinity gradients.

9.5.3.2 Potential Effects on Biological Characteristics of the Aquatic Ecosystem (Subpart D)

40 CFR 230.30 Threatened and Endangered Species

An endangered species is a plant or animal in danger of extinction throughout all or a significant portion of its range. A threatened species is one in danger of becoming an endangered species in the foreseeable future throughout all or a significant portion of its range. Listings of threatened and endangered species, as well as critical habitats, are maintained by some individual states and by the FWS. The 404 Guidelines specifically state that "where consultation with the Secretary of the Interior occurs under section 7 of the Endangered Species Act, the conclusions of the Secretary concerning the impact(s) of the discharge on threatened and endangered species and their habitat shall be considered final."

As discussed in Sections 4.3.1.6, 4.3.2.3, 5.3.1.3, and 5.3.2.3 of this EIS, FWS concurred with the review team's determination that the proposed Lee Nuclear Station Units 1 and 2 project is not likely to adversely affect Federally protected species nor result in adverse modification to designated or proposed critical habitat, thus completing informal consultation between the FWS and NRC (FWS 2012b). The Georgia aster (*Symphyotrichum georgianum*) is a candidate species for listing under the Endangered Species Act but does not currently receive Federal protection under that law. A small population consisting of 14 stems was observed in an existing transmission-line corridor in the Make-Up Pond C study area in 2009 (see Section 2.4.1.6). This population would be destroyed by the creation of Make-Up Pond C. As described in Section 4.3.1.7, this population of Georgia aster may be relocated to a nearby site of another newly found population or to botanical gardens.

As discussed in Sections 4.3.1.6, 4.3.2.3, 5.3.1.3, and 5.3.2.3 of this EIS, there will be no adverse effect on any State-listed threatened or endangered species. However, as described in Section 4.3.2.3, it is possible that the State-ranked (S1, critically imperiled) Carolina Fantail

Darter (*Etheostoma brevispinum*) could be affected by construction activities at the Broad River intake structure. In addition, populations of five plant species ranked by the State of South Carolina as imperiled or vulnerable (drooping sedge, southern enchanter's nightshade [*Circaea lutetiana* ssp. *canadensis*], southern adder's-tongue fern, Canada moonseed [*Menispermum canadense*], and single-flowered cancer root [*Orobanche uniflora*]) (see Sections 2.4.1.6 and 4.3.1.6) are located in the Make-Up Pond C study area. These populations would be destroyed by the creation of Make-Up Pond C. As described in Section 4.3.1.7, these populations may be relocated to species-specific suitable habitats in an as yet unidentified mitigation area for the Make-Up Pond C site or to botanical gardens.

40 CFR 230.31 Fish, Crustaceans, Mollusks, and Other Aquatic Organisms in the Food Web

Aquatic organisms in the food web include, but are not limited to, finfish, mollusks, insects, annelids, planktonic organisms, and plants and animals upon which they feed or depend. All forms and stages of an organism, throughout its geographic range, are included in this category. The discharge of dredged or fill material can variously affect populations of fish, crustaceans, mollusks, and other food web organisms through the release of contaminants that adversely affect adults, juveniles, larvae, or result in the establishment or proliferation of an undesirable competitive species of plant or animal at the expense of the desired resident species.

Suspended particulates settling on attached or buried eggs can smother the eggs by limiting or sealing off their exposure to oxygenated water. The discharge of dredged or fill material may result in the debilitation or death of sedentary organisms by smothering, exposure to chemical contaminants in dissolved or suspended form, exposure to high levels of suspended particulates, reduction in food supply, or alteration of the substrate upon which they depend. Mollusks are particularly sensitive to the discharge of material during periods of reproduction and growth and development due primarily to their limited mobility. The discharge of dredged or fill material can redirect, delay, or stop the reproductive and feeding movements of some species of fish and crustaceans, thus preventing their aggregation in accustomed places such as spawning or nursery grounds and potentially leading to reduced populations. Reduction of species that feed on detritus or other representatives of lower trophic levels can impair the flow of energy from primary consumers to higher trophic levels. The reduction or potential elimination of food chain organism populations decreases the overall productivity and nutrient export capability of the ecosystem.

<ins>Direct Impacts</ins>

<ins>Intake/Refill Structures</ins>: Minor temporary impacts on aquatic organisms will occur during the short duration of construction activities to install the structures. In addition, long-term impacts may result from water withdrawal to various life stages of aquatic organisms during operation. However, impacts associated with water withdrawal during normal operations have been

substantially reduced through the design of an intake that will be screened to minimize the entrainment of egg, larval, and juvenile life stages of aquatic organisms and the impingement of juvenile and adult life stages of aquatic organisms. Further, Section 316(b) of the CWA requires that the intake velocity not exceed 0.5 ft/s to further minimize entrainment and impingement effects. Conditions in the draft NPDES permit for Lee Nuclear Station will require that the intake velocity not exceed 0.5 ft/s. More specifically, two types of screen designs are proposed. The design for the Broad River and Make-Up Pond A intake structures includes dual-flow-type traveling screens with a fish return system. The screens would meet CWA Section 316 (b) requirements (i.e., mesh size 0.375 in. or less and through-screen velocity less than 0.5 ft/s). The Make-Up Pond B and Make-Up Pond C intakes would be passive wedge-wire cylindrical drum screens (proposed range of slot size is 0.079 to 0.374 in. and through-screen velocity less than 0.5 ft/s). While these screen designs do not prevent entrainment of early life stages of fish and shellfish, entrainment impacts would be minimized by compliance with an alternative equivalent to the EPA requirement to limit withdrawal to 5 percent of mean annual flow. Duke's water-management plan proposes to limit withdrawal from the Broad River for refill of Make-Up Pond B and Make-Up Pond C to the months of July through February, thereby minimizing water-volume-related impacts on aquatic biota. In addition, Duke is proposing a closed-cycle cooling system, which could reduce water withdrawal by 96 to 98 percent of the amount that facility would use if it employed a once-through system (66 FR 65256).

<u>Diffuser Structure</u>: Minor temporary impacts on aquatic organisms will occur during the short duration of construction activities to install the structure, including dredging within the Ninety-Nine Islands Reservoir dam forebay. Effects related to the discharge of water during normal operations are regulated and addressed by Section 402 of the CWA. Chemical, physical, and thermal effects are described in Section 5.3.2 and are concluded to be localized and minimal.

<u>Make-Up Pond A and Make-Up Pond B Dredging</u>: Dredging of the existing cofferdams and soil outcrops in Make-Up Pond A and Make-Up Pond B may result in direct mortality of benthic organisms and temporary displacement of some fish species. Upon completion of the dredging, benthic organisms may re-colonize the area. In addition, Dredging will result in localized and temporary increases in turbidity that may have adverse effects on aquatic life. Special conditions requiring implementation of BMPs such as appropriate use of turbidity curtains to minimize these impacts will be included in any Department of the Army permit issued by the USACE and/or Water Quality Certification issued by SCDHEC for the project.

<u>Make-Up Pond C Dam Infrastructure</u>: Because fill for the dam and saddle dikes will eliminate 1929 linear ft of stream and 0.04 ac of wetland (Table 9-20), individuals of some fish and macroinvertebrate species occupying this area will be lost. The construction of the spillway, stilling basin, and riprap will armor 636 linear ft of London Creek. During construction, London Creek will be diverted around the fill placement and armoring, minimizing the direct impact on aquatic species. While sedentary species will not be able to move downstream from

the impact area and will be lost, more mobile organisms may move to lower stream reaches after the upstream cofferdam has been constructed.

50-Ft-Wide Make-Up Pond C Buffer: Mechanical clearing and grubbing of the 50-ft-wide buffer of Make-Up Pond C may result in direct mortality impacts on aquatic species within wetlands and streams in the buffer. Secondary effects from turbid conditions may also occur. These aquatic resources will no longer receive shading and will have less habitat value in the altered state.

Borrow Excavation: The excavation of material for the construction of the Make-Up Pond C dam and saddle dikes will result in the elimination of 267 linear ft of tributary to London Creek (Table 9-20). Sedentary organisms that cannot move downstream during excavation will be lost. This area will ultimately be inundated by Make-Up Pond C.

SC 329 and Construction Roads: The relocation of SC 329 will result in permanent direct impacts on 396 linear ft of stream (Table 9-20), removing natural habitat and resulting in the direct loss of sedentary organisms. In general, new culvert constructions will replace existing SC 329 culverts. Since these tributaries exhibit seasonal flow regimes, new culverts can be placed during dry conditions, which should limit direct impacts on motile aquatic organisms. Culverts will be designed to allow for aquatic organism passage such as through the incorporation of countersinking. In general, the downstream ends of these culverts will outfall to the impoundment rather than additional stream habitat.

The roads necessary for the construction of Make-Up Pond C will result in the placement of culverts within 128 linear ft of stream. These culverts will be placed during dry conditions, which should limit direct impacts on motile aquatic organisms. Culverts will not be countersunk because these areas will be ultimately inundated by Make-Up Pond C. The construction roads will result in the placement of fill within 95 linear ft of stream. This area will also be ultimately inundated by Make-Up Pond C.

Lake Cherokee Dam and Spillway: The placement of riprap to stabilize the embankment of the Lake Cherokee dam will result in the elimination of 218 linear ft of stream habitat (Table 9-20), directly affecting organisms that cannot relocate downstream. This area will ultimately be inundated by Make-Up Pond C. Improvements to the Lake Cherokee emergency spillway will result in the placement of riprap within approximately 0.02 ac of Lake Cherokee (Table 9-20), permanently displacing a minor amount of benthic habitat.

Spoil Areas: Spoil stockpiled during the construction of the dam for Make-Up Pond C will result in the loss of 730 linear ft of stream (Table 9-20). Placement of this fill will lead to mortality of aquatic organisms that cannot relocate downstream.

Railroad Culvert Replacement: The replacement of the culvert at the railroad crossing of London Creek will result in the placement of fill material in 5 ft of London Creek and placement of a culvert in 140 linear ft of London Creek. During construction, London Creek will be diverted around the culvert replacement, minimizing the direct impact on aquatic species. While sedentary species will not be able to move downstream from the impact area and will be lost, more mobile organisms may move to lower stream reaches after the upstream cofferdam has been constructed. The box culverts proposed to replace the two existing 120-in.-diameter corrugated metal pipes will improve habitat connectivity upstream and downstream of the crossing; the scour present at the existing crossing prevents upstream movement of aquatic species during most flow events. The proposed replacement is a four-cell culvert of enlarged capacity that will allow more water to pass upstream of the culvert during flooding on the Broad River. One cell of the culvert will be constructed with engineered streambed material to provide a more natural channel for passage of fish and other aquatic organisms.

Secondary Effects

Intake/Refill Structures: Secondary effects on fish, crustaceans, mollusks, and other aquatic organisms may occur due to decreased water volumes in the Broad River associated with refilling Make-Up Pond B and/or Make-Up Pond C after any operational drawdown. Duke's proposed water-management plan (Duke Energy 2011h) would limit withdrawal from the Broad River for refill of Make-Up Pond B and Make-Up Pond C to the months of July through February and is intended to minimize water-volume-related impacts on aquatic biota.

Draining from Temporary Cofferdams: Draining behind the temporary cofferdams used for construction of the intake, refill, and diffuser structures will temporarily remove these areas as aquatic habitat. Any fish or invertebrate species present while water is being removed may experience mortality. Once the cofferdams are removed, these areas will again serve as aquatic habitat.

Inundation of Make-Up Pond C: The inundation of stream within the proposed Make-Up Pond C would result in the conversion of 60,414 linear ft of stream to lentic habitat. Trophic and pollution tolerance analyses conducted by Duke, and referenced in Duke's Supplement to the ER, indicated that the fish and macroinvertebrate communities currently inhabiting London Creek are relatively common (Duke 2009b, 2009c). The 22 fish species sampled within London Creek are consistent with those observed from nearby streams in the Broad River drainage of North Carolina and South Carolina and an SCDNR survey of 10 nearby South Carolina streams. Many of the fish species sampled in London Creek are from the *Centrarchidae* and *Ictaluridae* families and can inhabit both lotic and lentic habitats (Table 2-12) (Coughlan 2009). These species would be expected to maintain or rapidly re-establish even larger populations in the proposed Make-Up Pond C. Benthic macroinvertebrate communities sampled within London Creek were evaluated in the context of bioclassification according to NCDENR methodology. The benthic macroinvertebrate community scored "Fair" during 2008 sampling and “Good–Fair” in 2009. The existing benthic macroinvertebrate community of London Creek will be replaced by a macroinvertebrate community dominated by species adapted to lentic environments. Downstream of the proposed dam, the resulting change in hydrology and nutrient dynamics may change the benthic macroinvertebrate community and other trophic associations of the section of London Creek before the confluence with the Ninety-Nine Islands Reservoir. Given the minor contribution of London Creek to the total flow at Ninety-Nine Islands Reservoir; the absence of minimum flow from Lake Cherokee; and the proposed minimum flow to be maintained below the Make-Up Pond C dam (to commence with filling of the reservoir), any changes in London Creek hydrology or changes in water chemistry downstream of the proposed dam would have minor effects on aquatic communities within the Broad River. No effect is expected on the Smallmouth Bass fishery downstream of Ninety-Nine Islands Dam.

Draining of Farm Ponds: The draining of farm ponds will result in the direct mortality of fish and other aquatic species within the ponds. Prior to draining the ponds, Duke Energy will coordinate with the SCDNR to determine whether fish and other aquatic species can be relocated to other habitats. Some of these farm ponds will be ultimately inundated by Make-Up Pond C and will provide habitat for the same or similar fish community after inundation. Other farm pond areas will be the sites of spoil disposal and will cease to exist as habitat for aquatic species.

Transmission Lines: Hand-clearing of wetlands and riparian buffers within the transmission-line corridors may lead to potential minor increases in temperature over narrow segments of stream (200 to 325-ft-wide rights-of-way [Section 2.2.3.1]). These minor increases may make these short segments of stream undesirable for certain fish and macroinvertebrate species during the summer season. Shade provided by shrubs left in place will minimize the impact.

Railroad Culvert Replacement: Potential, temporary flooding of London Creek and adjacent wetlands during the replacement of the railroad culvert is not expected to substantially affect aquatic species.

40 CFR 230.32 Other Wildlife

Wildlife associated with aquatic ecosystems includes resident and migratory mammals, birds, reptiles, and amphibians. The discharge of fill material and associated impacts (noted in Table 9-20) can result in the loss or change of breeding and nesting areas, escape cover, travel corridors, resting areas, and preferred food sources for resident and migratory wildlife species associated with the aquatic ecosystem. These adverse impacts on wildlife habitat may result from changes in water levels, water flow and circulation, salinity, chemical content, or substrate characteristics and elevation. Increased water turbidity can adversely affect wildlife species that rely upon sight to feed and disrupt the respiration and feeding of certain aquatic wildlife and food chain organisms. The availability of contaminants from the discharge of dredged or fill material may lead to the bioaccumulation of such contaminants in wildlife. Changes in such physical and chemical factors of the environment may favor the introduction of non-native invasive plant and animal species at the expense of native species and communities. In some aquatic environments, lowering plant and animal species diversity may disrupt the normal functions of the ecosystem and lead to reductions in overall biological productivity.

Direct Impacts

The placement of fill associated with the Make-Up Pond C dam, SC 329, spoil areas, and railroad culvert replacement will result in permanent impact on 0.40 ac of wetland (Table 9-20). Less than 0.01 ac of wetland will be affected by mechanical clearing of the 50-ft-wide buffer for Make-Up Pond C. Temporary fill impacts will occur on an additional 0.10 ac of wetland during construction of the railroad culvert replacement and construction roads (Table 9-20). While sedentary species and less motile juveniles will not be able to move out of the impact area and will be lost, more mobile organisms may move to other wetland habitats as fill activities commence. Once temporarily affected wetlands return to former ecological function, wetland-dependent wildlife may repopulate these areas. The placement of fill material, including riprap and culvert material, in association with the Make-Up Pond C dam, SC 329, Lake Cherokee Dam, spoil areas, and the railroad culvert will permanently affect 4375 linear ft of stream (Table 9-20). Mechanical clearing of the 50-ft-wide buffer around Make-Up Pond C will affect 884 linear ft of stream (Table 9-20). Borrow excavation may affect as much as 267 linear ft of stream. Temporary fill for cofferdams during the replacement of the railroad culvert will affect 25 linear ft of stream. Wildlife dependent on streams for part of their lifecycle, such as many amphibians, would lose habitat in these areas. Activities within the open-water areas (e.g., the construction of intake, refill, and diffuser structures) and dredging within Make-Up Pond A and Make-Up Pond B are not expected to affect wildlife due to the localized nature of these activities.

Secondary Effects

Inundation of Make-Up Pond C: A total of 3.22 ac of wetlands will be permanently inundated by the construction of Make-Up Pond C (Table 9-20). In addition, if a 10-year storm event occurs during construction, 0.35 ac of wetlands may be temporarily flooded during the railroad culvert replacement (Table 9-20) because of water impounded by the cofferdams. Approximately 75 percent of the wetland areas in the Make-Up Pond C footprint are classified as having fully functional wildlife habitat, while habitat function for the other 25 percent is classified as ranging from partially impaired to very impaired (Duke 2011h). Thus, although these wetlands are generally small (typically less than 0.1 ac), most of them likely provide suitable habitat for many wetland/riparian species of mammals and birds observed in the London Creek drainage (Section 2.4.1.2). Individuals of these species within the Make-Up Pond C footprint would be lost due to inundation and the new open-water habitat could be used by only a select few of the original species, such as some species of waterfowl and wading birds. Some waterfowl and wading bird species may use suitable open-water and shoreline habitat if it is created as a result of the inundation of Make-Up Pond C. However, the development of suitable habitat is an eventuality that cannot be predicted with any certainty.

All the amphibian (i.e., frogs, toads, salamanders, and newts) species and some reptile species (i.e., all the turtle and some snake species) observed in the London Creek drainage require aquatic habitat during at least a portion of their life cycles (see Section 2.4.1.2). Flooding of wetlands and stream habitat would cause a reduction within the Make-Up Pond C inundation footprint of amphibian and reptile populations. Some of these losses might be partially offset by the later development of wetlands adjacent to Make-Up Pond C. However, this possibility cannot be predicted with any certainty. If wetlands were to develop adjacent to Make-Up Pond C, they would be more likely to become occupied by herpetofauna species adapted to lentic rather than lotic conditions. Consequently, herpetofauna adapted to lotic conditions within the Make-Up Pond C footprint would be lost, but would likely still exist in the stream segments upstream of Make-Up Pond C.

The mammal, bird, and herpetofauna species observed in the project area are common and similar suitable habitat for such species exists in the vicinity. Therefore, impacts on wildlife dependent on stream and wetland environments are not expected to be significant.

<u>Draining of Farm Ponds</u>: Draining the farm ponds within the project area removes a water feature periodically used by some wildlife. While the creation of Make-Up Pond C will provide the equivalent of some of the functions of these farm ponds, wetland compensatory mitigation may also provide open-water areas that would provide some open-water functions in support of wildlife.

<u>Transmission Lines</u>: A total of 1.36 ac of forested wetlands will be cleared by hand for transmission lines on the Lee Nuclear Station site and offsite (Table 9-20) to allow for conductor clearance. The clearing would not disturb wetland soil and will leave shrubs and emergent vegetation in place. Some wildlife may be displaced during the clearing operations. Wildlife species that favor scrub-shrub and herbaceous wetland environments would repopulate the area once the transmission lines are installed (Duke Power Company 1976) and mobile forest wildlife would disperse into similar nearby communities (Section 4.3.1.3).

9.5.3.3 Potential Effects on Special Aquatic Sites (Subpart E)

40 CFR Part 230.40 Sanctuaries and refuges

There are no sanctuaries or refuges in the area.

40 CFR 230.41 Wetlands

Wetlands consist of areas inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

The discharge of dredged or fill material in wetlands is likely to damage or destroy habitat and adversely affect the biological productivity of wetland ecosystems by smothering, dewatering, permanently flooding, or altering substrate elevation or periodicity of water movement. The addition of fill material may destroy wetland vegetation or result in the succession of terrestrial species. Further, it may reduce or eliminate nutrient exchange by reducing the system's productivity or by altering water current patterns and velocities. Disruption or elimination of the wetland system can degrade water quality by obstructing water-circulation patterns that flush large expanses of wetland systems, interfering with filtration function of wetlands, or by changing the aquifer recharge capability of a wetland. In addition, discharges can change the wetland habitat value for fish and wildlife, as discussed in Subpart D. When flow and circulation patterns are disrupted, even an apparently minor loss of wetland acreage may result in major losses in wetland function through secondary impacts. Discharging fill material in wetlands as part of municipal, industrial, or recreational development may modify the capacity of wetlands to retain and store floodwaters and to serve as a buffer zone, shielding upland areas from wave actions, storm damage, and erosion.

Direct Impacts

Fill placed during the construction of Make-Up Pond C will include 0.29 ac of permanent and 0.04 ac of temporary impacts on wetlands, including fill associated with the dam, necessary construction roads within the footprint of the future open-water area, and from the relocation of SC 329 prior to inundation of Make-Up Pond C (Table 9-20). Permanent and temporary fill associated with replacement of the railroad culvert below the Make-Up Pond C dam will involve direct impacts on0.11 and 0.06 ac, respectively (Table 9-20).

Secondary Effects

The creation of Make-Up Pond C will permanently inundate 3.22 ac of wetlands (Table 9-20). The replacement of the culvert at the railroad crossing of London Creek may cause a temporary impact on 0.35 ac of wetland (Table 9-20) if a 10-year storm event occurs during construction. The hand-clearing of tree and shrub vegetation within forested wetlands during the construction of the transmission lines will result in the conversion of 1.36 ac of forested wetland to scrub-shrub or herbaceous wetland (Table 9-20).

Summary

In proportion to the overall resource types within the watershed, the above-noted direct impacts and secondary effects are considered to be minor because of the small area that would be lost. Due to the hydrology of the onsite wetlands, impacts will not substantially disrupt flow and circulation patterns within wetlands.

The loss of wetland functions and values has been minimized through the provision of wetland compensatory mitigation as described in Section 4.3.1.7. Wetland compensatory mitigation would involve wetland credit purchases from a mitigation bank, potential re-establishment of wetlands at Sumter National Forest, and the preservation of wetlands at the Turkey Creek permittee-responsible mitigation site. To further minimize direct and secondary effects related to placement of fill, BMPs will be implemented by Duke (Sections 4.3.1.1 and 4.3.1.3) and will be required as special conditions to be included in any Department of the Army permit that may be issued for this project.

The following procedures and BMPs will minimize the secondary impacts of the discharges to wetlands:

1. Duke will follow and comply with all conditions attached to any Water Quality Certification issued for this project.

2. Prior to beginning any land-disturbing activity, appropriate erosion-control measures (e.g., fences, silt barriers, or other devices) will be placed between the disturbed area and the affected waterway or wetland and maintained in a functioning capacity until the area is permanently stabilized.

3. All necessary measures will be taken to prevent oil, tar, trash, and other pollutants from entering the adjacent offsite areas.

4. Once the project is initiated, it will be carried to completion in an expeditious manner to minimize the period of disturbance to the environment.

5. Upon project completion, all disturbed areas will be permanently stabilized with vegetative cover, riprap, or other erosion-control methods as appropriate.

6. Construction activities will avoid, to the greatest extent practicable, encroachment into any wetland/riverbank areas not designated as impact areas.

7. Construction activities within the Broad River will be minimized during the months of March through June because of potential impacts on fish spawning.

8. To the greatest extent practicable, clearing of riparian vegetation within wetlands and waters of the United States will be conducted manually and low-growing, woody vegetation (e.g., shrubs and saplings) will be left intact to maintain stream bank stability and reduce erosion. Rights-of-way through and adjacent to wetlands will be maintained by hand-clearing rather than with chemicals to reduce the potential for contamination of downstream aquatic resources, to the extent practicable.

9. Vegetation clearing (including timber harvest) and grubbing will be scheduled, to the extent practical, to avoid the migratory bird nesting season (generally March through June).

10. Any riprap used at the project will consist of clean stone or masonry material free of all potential sources of pollution.

11. Except for where indicated on the permit drawings, excavated material will not be stockpiled in the adjacent wetlands, but placed on barges or on high ground, when possible.

12. All excavated materials not used as backfill will be hauled offsite or placed on high ground and properly contained and permanently stabilized to prevent erosion.

13. Only clean earthen material free of all potential sources of pollution will be used as backfill.

14. Any equipment used within wetlands not identified for permanent impact will be equipped with high flotation tires or placed on mats when possible to minimize rutting and compaction.

15. Duke will not encroach into any wetlands or other waters of the United States unless they are identified by the plan set attached to the permit as impact areas.

40 CFR 230.42 Mud Flats

There are no mud flats in the project area.

40 CFR 230.43 Vegetated Shallows

There are no vegetated shallows in the project area.

40 CFR 230.44 Coral Reefs

There are no coral reefs in the project area.

40 CFR 230.45 Riffle and Pool Complexes

Steep gradient sections of streams are sometimes characterized by riffle and pool complexes. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a coarse substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. Pools are characterized by a slower stream velocity, a streaming flow, a smooth surface, and a finer substrate. Riffle and pool complexes are particularly valuable habitat for fish and wildlife.

Certain reaches of London Creek contain riffle and pool areas while other areas contain long stretches of sand and silt substrate. Riffle and pool complexes also occur on many of the southern tributaries to London Creek, while these special aquatic sites are generally absent on the northern tributaries that have been affected by past agricultural practices. The functional assessment used in the Charleston District Guidelines for Preparing a Compensatory Mitigation Plan (USACE 2010a) evaluates a ratio of riffles and pools for each stream reach. Of the 67,285 ft of affected streams, approximately 61 percent of the segments have frequent riffles, approximately 16 percent have infrequent riffles, approximately 13 percent have occasional riffles, and approximately 10 percent have no riffles. The presence of these special aquatic sites affects the functional assessment score of the affected stream reach and is therefore incorporated into the determination of required credits for compensatory mitigation.

Direct Impacts

Construction of the proposed Make-Up Pond C dam and associated infrastructure, Make-Up Pond C intake/refill structure, SC 329 relocation, construction roads, Lake Cherokee dam stabilization, railroad culvert, spoil areas, and borrow excavation will result in fill material placed within stream resources. The Make-Up Pond C intake/refill structure, construction roads, Lake Cherokee dam stabilization, and borrow excavation area will all be ultimately inundated by Make-Up Pond C. Riffle-pool complexes are present at the locations of these discharges.

The intake and refill structures at the Lee Nuclear Station site, diffuser structure, and dredging at Make-Up Pond A and Make-Up Pond B are not within riffle-pool complexes and will not affect this type of special aquatic site.

Secondary Effects

Draining from Temporary Cofferdams: These features are not within riffle-pool complexes.

Impoundment of Make-Up Pond C: The impoundment of London Creek will eliminate riffle-pool complexes within the footprint of the impoundment, converting them to lentic habitats. Riffle-pool complexes are present within the impounded segments of stream at a frequency similar to the overall impacts.

Draining of Farm Ponds: The farm ponds are not riffle-pool complexes and draining these resources will have no effect on riffle-pool complexes.

Transmission Lines: Transmission-line crossings have been designed to completely span every stream crossing and no dredged or fill material will be placed within any waters of the United States. Clearing of forest canopy will occur within transmission-line rights-of-ways, but shrub and groundcover vegetation will be maintained with the goal of minimizing sedimentation and erosion impacts in waters of the United States at stream crossings. Impacts to riffle-pool complexes are no expected at transmission-line crossings.

Railroad Culvert Replacement: If a 10-year flood event occurs during construction of the railroad culvert, some riffle-pool complex areas of London Creek will be temporarily inundated. No long-term effect is expected if the area is temporarily inundated.

Summary

The creation of Make-Up Pond C will eliminate riffle-pool complex resources within the footprint of the impoundment. Compensatory wetland and stream mitigation is described in Section 4.3.1.7 and will involve the purchase of mitigation credits from a mitigation bank serving the Broad River watershed, a permittee-responsible mitigation project at the Sumter National Forest involving the restoration of stream habitat, and a permittee-responsible mitigation project involving the preservation and enhancement of high-quality stream resources and associated riparian buffer at the Turkey Creek site. The permittee-responsible mitigation at the Sumter National Forest will result in the creation, restoration, and enhancement of riffle-pool habitat on degraded streams that no longer support such special aquatic sites. To further minimize direct and secondary effects related to placement of fill, special conditions requiring the use of BMPs will be included in any Department of the Army permit that may be issued for this project.

The following procedures and BMPs will minimize the secondary impacts of the discharges to riffle-pool complexes:

- Duke Energy will comply with all conditions attached to any Water Quality Certification issued for this project.
- Prior to beginning any land-disturbing activity, appropriate erosion-control measures (e.g., as fences, silt barriers, or other devices) will be placed between the disturbed area and the affected waterway or wetland, and maintained in a functioning capacity until the area is permanently stabilized.
- All necessary measures will be taken to prevent oil, tar, trash, and other pollutants from entering the adjacent offsite areas.
- Once the project is initiated, it will be carried to completion in an expeditious manner to minimize the period of disturbance to the environment.
- Upon project completion, all disturbed areas will be permanently stabilized with vegetative cover, riprap, or other erosion-control methods as appropriate.

- Construction activities will avoid, to the greatest extent practicable, encroachment into any wetland/stream areas not designated as impact areas.
- To the greatest extent practicable, clearing of riparian vegetation within wetlands and waters of the United States will be conducted manually, and low-growing, woody vegetation (e.g., shrubs and saplings) will be left intact to maintain stream bank stability and reduce erosion.
- Rights-of-way through and adjacent to wetlands will be maintained by hand-clearing rather than with clearing with chemicals to reduce the potential for contamination of downstream aquatic resources, to the extent practicable. Vegetation clearing (including timber harvest) and grubbing will be scheduled, to the extent practical, to avoid the migratory bird nesting season (generally March through June).
- Culverts for SC 329 will be countersunk to provide for low-flow conditions and aquatic organism passage.
- Construction of the dam, the railroad culvert, and SC 329 culverts will be done using pumps to divert the flow of London Creek or subject tributaries. Placement of culverts for temporary construction roads will be accomplished while the streams are in a dry condition.
- Any riprap used at the project will consist of clean stone or masonry material free of all potential sources of pollution.
- Except for where indicated on the permit drawings, excavated material will not be stockpiled in the adjacent wetlands, but placed on barges or on high ground, when possible.
- All excavated materials not used as backfill will be hauled offsite or placed on high ground and properly contained and permanently stabilized to prevent erosion.
- Only clean earthen material free of all potential sources of pollution will be used as backfill.
- Duke Energy will not encroach into any wetlands or other waters of the United States unless they are identified by the plan set attached to the permit as impact areas.

9.5.3.4 Potential Effects on Human Use Characteristics (Subpart F)

40 CFR 230.50 Municipal and private water supplies

Municipal and private water supplies consist of surface water or groundwater directed to the intake of a municipal or private water-supply system. Discharges can affect the quality of water supplies with respect to color, taste, odor, chemical content, and suspended particulate concentration in such a way as to reduce the fitness of the water for consumption. Water can be rendered unpalatable or unhealthy by the addition of suspended particulates, viruses and pathogenic organisms, and dissolved materials. The expense of removing such substances before the water is delivered for consumption can be high. Discharges may also affect the quantity of water available for municipal and private water supplies. In addition, certain commonly used water-treatment chemicals have the potential for combining with some suspended or dissolved substances from dredged or fill material to form other products that can have a toxic effect on consumers.

As described in Sections 5.2.2.1 and 5.2.2.2, this project will affect surface or groundwater supplies by consumptive use for cooling and other operational uses; however, these activities will be regulated under the NPDES permit and municipal and private water supplies will not be affected by construction or operation of this project. Minimum flows for Ninety-Nine Islands Dam established under the FERC license are maintained by the water-management plan for Lee Nuclear Station (Duke 2011a).

40 CFR 230.51 Recreational and commercial fisheries

Recreational and commercial fisheries consist of harvestable fish, crustaceans, shellfish, and other aquatic organisms used by humans. The discharge of dredged or fill material can affect the suitability of recreational and commercial fishing habitat for populations of consumable aquatic organisms. Discharges can result in the chemical contamination of recreational or commercial fisheries. They may also interfere with the reproductive success of recreational and commercially important aquatic species through disruption of migration and spawning areas. The introduction of pollutants at critical times in an aquatic species' life cycle may directly reduce populations of commercially important aquatic organisms or indirectly reduce populations of commercially important aquatic organisms by reducing organisms upon which they depend for food. Any of these impacts can be of short duration or prolonged, depending upon the physical and chemical impacts of the discharge and the biological availability of contaminants to aquatic organisms.

Summary

No commercial fishery exists within the project vicinity. No recreational fishery exists within the London Creek system. The proposed discharge of fill material into wetlands and other waters of the United States would have no noticeable effect on the recreation fisheries in the Ninety-Nine Islands Reservoir or downstream within the Broad River. The discharges from the blowdown diffuser are anticipated to have minimal effect on recreational species within the Broad River and are addressed in Section 5.3.2.1 of the EIS and the NPDES permit under Section 402 of the CWA.

The creation of Make-Up Pond C may help to increase stocks of common recreational fish species. Fish may occasionally pass over the Make-Up Pond C spillway. When fish pass downstream of the Make-Up Pond C dam, this new impoundment could be a source of recruitment to Ninety-Nine Islands Reservoir and the Broad River. Mitigation activities at Sumter National Forest may provide indirect benefits to the Broad River fishery, including the Smallmouth Bass fishery, by improving in-stream habitat and reducing sediment transport to the river.

40 CFR 230.52 Water-related recreation

Water-related recreation encompasses activities undertaken for amusement and relaxation. Activities encompass two broad categories of use: consumptive (e.g., harvesting resources by hunting and fishing) and non-consumptive (e.g., canoeing and sightseeing). One of the more important direct impacts of dredged or fill disposal is to impair or destroy the resources that support recreation activities. The disposal of dredged or fill material may adversely modify or destroy water use for recreation by changing turbidity; suspended particulates; temperature; dissolved oxygen; dissolved materials; toxic materials; pathogenic organisms; quality of habitat; or the aesthetic qualities of sight, taste, odor, and color.

<u>Direct Impacts</u>

Construction of the intake structure on the Ninety-Nine Islands Reservoir would temporarily narrow the reservoir while the cofferdams are in place, but is not expected to affect recreation on the reservoir. Dredge and fill activities for the project are not expected to affect water-related recreation on the Broad River below the Ninety-Nine Islands Dam, which is considered a State Scenic River from the dam to the confluence with the Pacolet River. The water-management plan for the operation of the intake structure ensures that minimum flows will be maintained below the Ninety-Nine Islands Dam during periods of extended drought and it is addressed in the NPDES permit application. Structures associated with the transmission lines, which will be constructed in uplands, will likely not be visible from the river. Construction activities for Make-Up Pond C would not affect water-related recreation at Lake Cherokee.

<u>Secondary Effects</u>

No water-related recreation occurs within London Creek; therefore, no secondary effects are expected due to the creation of Make-Up Pond C.

<u>Summary</u>

Recreation is not expected to be affected by Lee Nuclear Station construction. Compensatory mitigation at Sumter National Forest will improve access across the restored streams for hiking and horseback-riding activities and will provide indirect benefits to the Broad River fishery, including the Smallmouth Bass fishery, by improving in-stream habitat and reducing sediment transport to the river.

40 CFR 230.53 Aesthetics

Aesthetics associated with the aquatic ecosystem consist of the perception of beauty by one or a combination of the senses of sight, hearing, touch, and smell. The aesthetics of aquatic ecosystems apply to the quality of life enjoyed by the general public and property owners. The discharge of dredged or fill material can mar the beauty of natural aquatic ecosystems by degrading water quality, creating distracting disposal sites, inducing inappropriate development, encouraging unplanned and incompatible human access, and by destroying vital elements that contribute to the compositional harmony or unity, visual distinctiveness, or diversity of an area. The discharge of dredged or fill material can adversely affect the particular features, traits, or characteristics of an aquatic area that make it valuable to property owners. Activities that degrade water quality, disrupt natural substrate and vegetational characteristics, deny access to or visibility of the resource, or result in changes in odor, air quality, or noise levels may reduce the value of an aquatic area to private property owners.

Direct Impacts

The construction of Lee Nuclear Station will create temporary adverse impacts on the aesthetics of the area. These impacts will be related to vegetation grubbing and clearing, spoil piles, storage of construction equipment and trailers, forest clear-cutting work, and earthmoving activities. The Lee Nuclear Station site is 0.74 mi from the nearest residence, is not readily visible to motorists from McKowns Mountain Road, and is not open to the public. Structures at the Lee Nuclear Station, which will not be placed within waters of the United States, may be visible from Ninety-Nine Islands Reservoir.

Secondary Impacts

Impoundment of Make-Up Pond C: During construction of Make-Up Pond C, minor and temporary impacts on aesthetics will occur during clearing and grubbing activities. Once Make-Up Pond C has been filled, the presence of this waterbody will represent a beneficial effect to aesthetics in the vicinity, because, in general, most people find waterbodies aesthetically pleasing.

Transmission Lines: Transmission lines for the project will be installed in areas that are rural in nature and will have long-term adverse but minor impacts on residential and agricultural/ commercial properties. As detailed in Section 2.2.3 and summarized above, 31 mi of transmission lines are associated with this project. The transmission lines will not adversely affect the scenic section of the Broad River or any historic properties. The adverse impacts on aesthetics associated with installation of transmission lines will be minor though long-term.

Summary

Minor impacts on aesthetics, primarily due to upland activities, are expected during the construction of Lee Nuclear Station, while the completion of Make-Up Pond C may be seen as a positive benefit to aesthetics. Mitigation activities at Sumter National Forest will improve aesthetics in the subject watershed by restoring incised and eroded banks.

40 CFR 230.54 Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves

These preserves consist of areas designated under Federal and State laws or local ordinances to be managed for their aesthetic, educational, historical, recreational, or scientific value. The discharge of dredged or fill material into such areas may modify the aesthetic, educational, historical, recreational, and/or scientific qualities, thereby reducing or eliminating the uses for which such sites are set aside and managed.

<u>Summary</u>

This project includes work on the Lake Cherokee Dam and updating the performance of the emergency spillway. Lake Cherokee is owned and managed by the SCDNR for fishing and boating. All work on SCDNR lands will be coordinated with the SCDNR. As part of this work, Duke will be adding a formal parking area and handicap access to the top of the earthen dam to improve access to this recreational resource. No permanent adverse effects are expected as a result of this work. Some of the compensatory mitigation will occur on Sumter National Forest. Although national forests are not necessarily parks, they have some park-like values and functions. Some temporary effects on the national forest will occur during the restoration work, but the restoration work will provide substantial net benefits to this public resource.

9.5.3.5 Evaluation and Testing (Subpart G)

40 CFR 230.60 and 230.61 General evaluation of dredged or fill material and chemical, biological and physical evaluation and testing

All fill material will be clean material from upland source sites and therefore no testing is required.

10.0 Conclusions and Recommendations

This chapter provides a discussion of the conclusions reached in this environmental impact statement (EIS) and the U.S. Nuclear Regulatory Commission (NRC) staff's recommendations. Section 10.1 summarizes the impacts of the proposed action, Section 10.2 summarizes the proposed project's unavoidable adverse impacts, and Section 10.3 discusses the relationship between the short-term use of resources and long-term productivity of the human environment. Section 10.4 summarizes the irretrievable and irreversible use of resources, and Section 10.5 summarizes the alternatives to the proposed action. Section 10.6 discusses benefits and costs. Section 10.7 includes the NRC staff's recommendation.

By letter dated December 12, 2007, the NRC received an application from Duke Energy Carolinas, LLC (Duke), for combined construction permits and operating licenses (COLs) for two new nuclear reactors at the William States Lee III Nuclear Station (Lee Nuclear Station) site in Cherokee County, South Carolina (Duke 2007a). The proposed Lee Nuclear Station Units 1 and 2 would be owned and operated by Duke (Duke 2009b). With the exception of transmission systems needed to route power from the proposed units and an offsite reservoir (i.e., Make-Up Pond C), all of the construction and operation related to Units 1 and 2 would be completely within the confines of the Lee Nuclear Station site, the unfinished Duke Power Company Cherokee Nuclear Station site (Duke 2009b). The reactors specified in the application are Westinghouse Electric Company, LLC (Westinghouse) Advanced Passive 1000 (AP1000) pressurized water reactors. The application references Revision 19 of the AP1000 certified design (Westinghouse 2011). In November 2011, Duke submitted an application to the U.S. Army Corps of Engineers (USACE) for a Department of the Army individual permit to conduct construction activities that would result in alteration of waters of the United States, including wetlands. The USACE is participating in preparing this EIS as a cooperating agency.

The proposed actions in these applications are (1) NRC issuance of COLs for constructing and operating two new nuclear units at the Lee Nuclear Station site, and (2) USACE issuance of permits pursuant to Section 404 of the Federal Water Pollution Control Act (33 U.S.C. 1344), as amended by the Clean Water Act of 1977 (33 USC 1251 et seq.) (hereafter referred to as the Clean Water Act) to perform certain construction activities on the site.

Section 102 of the National Environmental Policy Act of 1969, as amended (NEPA) (42 U.S.C. 4321 et seq.) directs that an EIS is required for a major Federal action that significantly affects the quality of the human environment. Section 102(2)(C) of NEPA requires that an EIS include information about the following:

- the environmental impact of the proposed action
- any adverse environmental effects that cannot be avoided should the proposed action be implemented

- alternatives to the proposed action
- the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity
- irreversible and irretrievable commitments of resources that would be involved if the proposed action is implemented.

The NRC has implemented NEPA in Title 10 of the *Code of Federal Regulations* (CFR) Part 51. In 10 CFR 51.20, the NRC requires preparation of an EIS for issuance of COLs. Subpart C of 10 CFR Part 52 contains the NRC regulations related to COLs.

Included in this EIS are (1) the results of the review team's preliminary analyses, which consider and weigh the environmental effects of the proposed action; (2) mitigation measures for reducing or avoiding adverse effects; (3) the environmental impacts of alternatives to the proposed action; and (4) the NRC staff's preliminary recommendation regarding the proposed action based on its environmental review. The USACE will base its evaluation of the Department of the Army individual permit application on the requirements of USACE regulations, Clean Water Act Section 404(b)(1) Guidelines, and the USACE public interest review process. The USACE permit decision will be made following issuance of the final EIS.

The environmental review described in this EIS was conducted by a team consisting of NRC staff, its contractor's staff, and USACE staff. During the course of preparing this EIS, the team reviewed the environmental report (ER) submitted by Duke (2009c) and the supplement to the ER regarding Make-Up Pond C (Duke 2009b); consulted with Federal, State, Tribal, and local agencies; and followed the guidance set forth in the NRC's Environmental Standard Review Plan (ESRP) (NRC 2000a) and *Staff Memorandum Revision 1 - Addressing Construction and Preconstruction, Greenhouse Gas Issues, General Conformity Determinations, Environmental Justice, Need for Power, Cumulative Impact Analysis, and Cultural/Historical Resources Analysis Issues in Environmental Impact Statement*s (NRC 2011a). In addition, the NRC considered the public comments related to the environmental review received during the original scoping process in 2008 and the supplemental scoping process related to Make-Up Pond C in 2010. These comments are provided in Appendix D of this EIS. The NRC staff considered public comments received on the draft EIS, which was published in December 2011. The comments and staff responses are provided in Appendix E of this EIS.

As a cooperating agency, the USACE has participated in the environmental review of the proposed action, the public scoping and draft EIS meetings, public comment resolution, and EIS preparation. The proposed action includes impacts on waters of the United States, including wetlands. For actions requiring a Section 404 Clean Water Act permit for the discharge of dredged and/or fill material into waters of the United States, regulations promulgated by the U.S. Environmental Protection Agency (EPA) require USACE to limit its authorization to the least environmentally damaging practicable alternative. The USACE will document its conclusion of the review process, including the requirement for compensatory mitigation in accordance with 33 CFR Part 332, Compensatory Mitigation for Losses of Aquatic Resources, in its permit-decision document.

The proposed source of cooling water and the recipient of effluent for proposed Lee Nuclear Station Units 1 and 2 is the Ninety-Nine Islands Reservoir, which is a feature of the Ninety-Nine Islands Hydroelectric Project, operated by Duke and regulated by the Federal Energy Regulatory Commission (FERC). FERC has requested to be a participating agency in the environmental review of Duke's combined license application for the Lee Nuclear Station (FERC 2011a). Upon receipt of an application from Duke, FERC must conduct a review of Duke's water withdrawal/discharge proposal and accompanying construction activities for the Lee Nuclear Station that occur within the hydroelectric project boundary. Duke expects to apply for necessary FERC permits in 2013.

Following the practice of the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (NUREG-1437) (NRC 1996) and supplemental license renewal EISs, environmental issues are evaluated using the three-level standard of significance—SMALL, MODERATE, or LARGE—developed by the NRC using guidelines from the Council on Environmental Quality (CEQ) (40 CFR 1508.27). Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, provides the following definitions of the three significance levels:

> SMALL – Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
>
> MODERATE – Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
>
> LARGE – Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

Mitigation measures were considered for each environmental issue and are discussed in the appropriate sections. During its environmental review, the review team considered planned activities and actions that Duke indicates it and others would likely take should Duke receive the COLs. In addition, Duke provided estimates of the environmental impacts resulting from building and operating two new nuclear units on the Lee Nuclear Station site.

10.1 Impacts of the Proposed Action

In a final rule dated October 9, 2007 (72 FR 57416), the Commission limited the definition of "construction" to those activities that fall within its regulatory authority (10 CFR 51.4). Many of the activities required to build a nuclear power plant are not part of the NRC action to license the plant. Activities associated with building the plant that are not within the purview of the NRC action are grouped under the term "preconstruction." Preconstruction activities include clearing and grading, excavating, erection of support buildings and transmission lines, and other associated activities. Because "preconstruction" activities are not part of the NRC action, their impacts are not reviewed as a direct effect of the NRC action. Rather, the impacts of the preconstruction activities are considered in the context of cumulative impacts. In addition, certain preconstruction activities require permits from the USACE, as well as other Federal, State, and local agencies.

Chapter 4 of this EIS describes the relative magnitude of impacts related to preconstruction and construction activities with a summary of impacts in Table 4-7. Impacts associated with operation of the proposed facilities are discussed in Chapter 5 and are summarized in Table 5-20. Chapter 6 describes the impacts associated with the fuel cycle, transportation, and decommissioning. Chapter 7 describes the impacts associated with preconstruction and construction activities and operation of Units 1 and 2 when considered along with the cumulative impacts of other past, present, and reasonably foreseeable future projects in the geographical region around the Lee Nuclear Station site.

10.2 Unavoidable Adverse Environmental Impacts

Section 102(2)(C)(ii) of NEPA requires that an EIS include information on any adverse environmental effects that cannot be avoided should the proposal be implemented. Unavoidable adverse environmental impacts are those potential impacts of the NRC and USACE action that cannot be avoided and for which no practical means of mitigation are available.

10.2.1 Unavoidable Adverse Impacts During Construction and Preconstruction Activities

Chapter 4 discusses in detail the potential impacts from construction and preconstruction of the proposed Lee Nuclear Station Units 1 and 2. Table 10-1 presents the unavoidable adverse impacts associated with construction and preconstruction activities to each of the resource areas evaluated in this EIS and the mitigation measures that would reduce the impacts.

The impact determinations in Table 10-1 are for the combined impacts of construction and preconstruction, unless otherwise noted. For the resources areas of water use, water quality, socioeconomics (with the exception of physical impacts—aesthetics), environmental justice, air quality, nonradiological and radiological health, and nonradioactive waste, the impact determinations for NRC-regulated construction are the same as those for construction and preconstruction combined. The impact determinations for NRC-authorized construction alone and combined construction and preconstruction, are different for land use, aquatic ecology, terrestrial and wetland ecosystems, socioeconomics (only physical impacts—aesthetics), and historic and cultural resources. For these impact determinations that differ, the impacts from the NRC-regulated activities are discussed below the table.

Table 10-1. Unavoidable Adverse Environmental Impacts from Construction and Preconstruction Activities

Resource Area	Impact Level	Actions to Mitigate Impacts	Unavoidable Adverse Impacts
Land Use	MODERATE; SMALL for NRC-authorized construction activities	Follow BMPs; minimize encroachment into wetlands and floodplains, use flexibility in transmission-line corridor routing.	Permanent or temporary use of approximately 946 ac on the Lee Nuclear Station site, approximately 1100 ac for Make-Up Pond C, and 987 ac for transmission-line corridors. Minor additional land required for railroad spur and offsite road improvements. Loss of approximately 262 ac of prime farmland and farmland of Statewide importance onsite and for Make-Up Pond C.
Water-Related Impacts			
Water Use	SMALL	No mitigation required.	Impacts on surface-water use would be of limited duration, and peak water demands would represent a small portion of the available water from the Draytonville Water District.
		No mitigation required.	Groundwater would not be used during building, and groundwater-use impacts from dewatering would be limited in magnitude, temporary, and localized.
		No mitigation required.	Groundwater-use effects from filling Make-Up Pond C would be limited to private wells adjacent to the pond. Pumping lift would be reduced when Make-Up Pond C is full, and would be no lower than levels prior to construction when Make-Up Pond C is drawn down.
Water Quality	SMALL	Implement BMPs to control erosion and sedimentation; implement BMPs to ensure dewatering product is discharged with minimal impact to nearby waterbodies; prepare and implement SWPPP to and prevent spills and minimize their impact.	Temporary degradation of surface-water quality due to runoff and erosion. Impacts of filling Make-Up Pond C, discharge of excavation dewatering product, and spills would be localized, temporary, and of limited magnitude.

Table 10-1. (contd)

Resource Area	Impact Level	Actions to Mitigate Impacts	Unavoidable Adverse Impacts
Ecology (Terrestrial)	MODERATE; SMALL for NRC-authorized construction activities	Implement wetland mitigation as required by the USACE; implement mitigation for Federal candidate and State-ranked plant species in coordination with the FWS and the SCDNR, respectively; implement BMPs during preconstruction and construction.	Permanent or temporary losses of 423 ac of forest, permanent clearing of 0.21 ac of forested jurisdictional wetlands, permanent loss of 9.25 ac of non-jurisdictional features, and the temporary drawdown of 5.46 ac of jurisdictional wetlands fringing Make-Up Ponds A and B during an approximate 3-year period on the Lee Nuclear Station site. Permanent or temporary losses of 0.5 ac of forest and 0.52 ac of wetlands along the railroad-spur corridor. Transmission-line corridors would permanently disturb about 690 ac of forest and require permanent clearing of woody vegetation from approximately 1.15 ac of jurisdictional wetlands. Make-Up Pond C would impact about 821 ac of forest (of which about 545 ac are mixed hardwood and mixed hardwood-pine forest along London Creek and its tributaries), and disturb about 3.55 ac of jurisdictional wetlands and about 884 linear ft of forest vegetation along jurisdictional streams.
Ecology (Aquatic)	MODERATE; SMALL for NRC-authorized construction activities	Implement mitigation as required by the USACE. Comply with Federal permits and State 401 water-quality certification. Prepare and implement SWPPP and BMPs to control erosion and sedimentation.	Inundation of London Creek and the formation of Make-Up Pond C would result in the permanent loss of 12.3 mi of creek habitat and in the alteration of 17.58 ac of open-water habitat. There would be an additional permanent loss of 145 ft of tributaries associated with the installation of an enlarged replacement culvert under the existing railroad spur. On the Lee Nuclear Station site, 9.37 ac of open-water habitat would be permanently altered (1.48 ac filled, 7.89 ac dredged). Temporary impacts to aquatic habitat from preconstruction and construction activities (e.g., clearing, filling, drawdowns) include an additional 884 linear ft of tributaries associated with

Table 10-1. (contd)

Resource Area	Impact Level	Actions to Mitigate Impacts	Unavoidable Adverse Impacts
			the building of Make-Up Pond C, 1345 linear ft of tributaries associated with the culvert replacement project under the existing railroad spur, and 94.68 ac of open-water habitat on the Lee Nuclear Station site.
Socioeconomics			
Physical Impacts	MODERATE; SMALL for NRC-authorized construction activities	None	Developing Make-Up Pond C would involve clearing forested land, which would negatively impact travelers on SC 329 and residents in the vicinity of the Make-Up Pond C site.
Demography	SMALL	None	None
Economic Impacts on the Community	SMALL	None	None
Infrastructure and Community Services	MODERATE for traffic impacts, SMALL for other infrastructure and community service impacts; MODERATE for traffic impacts, SMALL for other infrastructure and community service impacts for NRC-authorized construction activities.	Implement traffic-management plan during site development.	Temporary, highly localized periodic traffic impacts during building.
Environmental Justice	SMALL	None	None
Historic and Cultural	MODERATE; SMALL for NRC-authorized construction activities	Implement MOA and cultural resources management plan between Duke, the	Inundation of Make-Up Pond C would require relocation of the Service Family Cemetery (in coordination with the South Carolina SHPO, in accordance to State law, and in cooperation with

Table 10-1. (contd)

Resource Area	Impact Level	Actions to Mitigate Impacts	Unavoidable Adverse Impacts
		USACE, South Carolina SHPO, and Catawba Indian Nation including protection of known historic properties and cultural resources, investigations prior to ground-disturbing activities, and procedures for any inadvertent cultural resources discoveries.	descendants) and permanently alter the character, setting, and historic context of this cultural resource.
Air Quality	SMALL	Implement a dust-control plan prior to site preparation that would include dust-mitigation measures. Obtain required air-quality permits from the SCDHEC.	Temporary degradation of local air quality due to vehicle emissions and dust particle emissions during ground clearing, grading excavation activities, and operation of concrete batch plant and other temporary stationary sources.
Nonradiological Health	SMALL	Implement a dust-control plan; adhere to Federal, State, and local emission requirements. Train workers in appropriate safety requirements; adherence to OSHA requirements. Restrict most noise-related activities to daylight hours.	Localized, temporary impacts to public and worker health from dust, exhaust, and construction equipment emissions. Occupational injuries to personnel. Noise from building activities.
Radiological Health	SMALL	Maintain doses to construction workers below NRC public dose limits.	Small doses to construction workers that would be less than NRC public dose limits.

Table 10-1. (contd)

Resource Area	Impact Level	Actions to Mitigate Impacts	Unavoidable Adverse Impacts
Nonradioactive Waste	SMALL	Implement BMPs to minimize waste generation. Manage wastes in accordance with Federal, State, and local requirements. Comply with requirements of NPDES and air quality permits	Creation of construction debris and minor amounts of hazardous wastes. Permitted site stormwater releases to surface water. Minor, localized, and temporary air emissions from construction equipment and temporary stationary sources.

BMPs = Best Management Practices
DOT = U.S. Department of Transportation
FWS = U.S. Fish and Wildlife Service
MOA = Memorandum of Agreement
NPDES = National Pollutant Discharge Elimination System
OSHA = Occupational Safety and Health Administration
SCDHEC = South Carolina Department of Health and Environmental Control
SCDNR = South Carolina Department of Natural Resources
SHPO = State Historic Preservation Office
SWPPP = Stormwater Pollution Prevention Plan
USACE = U.S. Army Corps of Engineers

The NRC staff concludes that the potential unavoidable adverse impacts on land use, terrestrial and wetland ecosystems, aquatic resources, socioeconomics (physical impacts—aesthetics), and historic and cultural resources from construction and preconstruction would be MODERATE; however, the NRC-authorized construction impact for these resource areas would be SMALL. Most unavoidable adverse impacts would be attributable to preconstruction activities associated with onsite facilities outside of the power block, Make-Up Pond C, and the transmission-line corridors. Socioeconomic impacts on infrastructure and community services (traffic) would be MODERATE for both preconstruction and NRC-authorized construction.

Land-use impacts resulting from NRC-authorized construction of Lee Nuclear Station Units 1 and 2 would be SMALL. Much of the land-use demands for building the Lee Nuclear Station project are associated with preconstruction activities such as building Make-Up Pond C and clearing the corridors for the transmission lines.

Impacts to terrestrial and aquatic resources from NRC-authorized construction would be SMALL. Impacts from construction of safety-related facilities for Lee Nuclear Station Units 1 and 2 would be negligible compared to impacts from preconstruction activities.

The impact of NRC-authorized construction on historic and cultural resources would be SMALL. It is unlikely that the historic and cultural resources previously recorded at the unfinished Cherokee Nuclear Station site are preserved given the high levels of earlier ground disturbance. In 2009, 2012, and 2013, the South Carolina SHPO concurred with the determination that proposed onsite activities would not adversely affect historic properties.

The impact of NRC-authorized construction activities on aesthetics in the vicinity of the Lee Nuclear Station site would be SMALL. The Lee Nuclear Station is bounded by woodlands and water features, and the NRC-authorized construction activities would only be visible by those using the Broad River and Ninety-Nine Islands Reservoir.

10.2.2 Unavoidable Adverse Impacts During Operation

Chapter 5 provides a detailed discussion of the potential impacts from operation of the proposed Lee Nuclear Station Units 1 and 2. The unavoidable adverse impacts related to operation are listed in Table 10-2 and are summarized below.

Table 10-2. Unavoidable Adverse Environmental Impacts from Operation

Resource Area	Impact Level	Actions to Mitigate Impacts	Unavoidable Adverse Impacts
Land Use	SMALL	None	Continued use of permanent land commitments, including approximately 619 ac of land on the Lee Nuclear Station site, approximately 1050 ac of land for Make-Up Pond C, and 987 ac of land for transmission lines. Minor additional land required for the railroad spur and offsite road improvements.
Water-Related Impacts			
Water Use	SMALL	Surface Water—Comply with SCDHEC NPDES permit requirements and State water withdrawal regulations	Consumptive use of 55 cfs of water withdrawn from the Broad River (3 percent of the mean annual flow).
		Groundwater—None	There would be no use of groundwater during operation. There would be only local and short-term effects on groundwater from drawdown of the makeup ponds during low-river-flow events.

Table 10-2. (contd)

Resource Area	Impact Level	Actions to Mitigate Impacts	Unavoidable Adverse Impacts
Water Quality	SMALL	Surface Water—Comply with SCDHEC NPDES permit requirements	Increased temperature and concentrations of chemicals in cooling-tower blowdown discharged to the Broad River.
		Groundwater—None	There would be no use of groundwater and no discharges to groundwater during operation. The effects of Make-Up Pond C during fill events on water quality in nearby groundwater wells would be similar to existing groundwater quality in the region, temporary, and minor.
Ecology (Terrestrial)	SMALL	Comply with Federal and State permitting requirements; minimize heat-dissipation system impacts; implement BMPs to minimize transmission-line operation and transmission-line and water-pipeline corridor maintenance impacts; operate wastewater treatment basins to minimize potential impacts to avifauna.	Minor impacts of cooling towers; minor impacts of transmission-line operation and transmission-line and water-pipeline corridor maintenance; minor impacts to wetlands from drawdown of cooling-water reservoirs; minor impacts to wildlife from all other plant operations and maintenance activities.
Ecology (Aquatic)	SMALL	Comply with Federal and State permitting requirements; manage frequency and timing of maintenance dredging; comply with SWPPP; implement BMPs (e.g., approved herbicide usage near streams and waterbodies); and manage drawdown and refill of the Make-Up Ponds to minimize potential impacts to aquatic organisms and their habitat in the Broad River and Make-Up Ponds.	Minor impacts to aquatic biota from impingement and entrainment due to cooling-water withdrawal from Ninety-Nine Islands Reservoir, and Make-Up Ponds A, B, and C. Temporary and minor changes to the distribution and abundance of some aquatic species due to thermal, chemical, and physical effects associated with station blowdown into Ninety-Nine Islands; changes to the distribution and abundance of some aquatic species due to

Table 10-2. (contd)

Resource Area	Impact Level	Actions to Mitigate Impacts	Unavoidable Adverse Impacts
			the operation of the cooling-water reservoirs. Introduction of sediments and pollutants into onsite waterbodies, and impacts from maintenance dredging activities in the Broad River and Make-Up Pond A. Minor disturbance to aquatic resources due to transmission-line-corridor maintenance and operation activities.
Socioeconomics			
Physical Impacts	SMALL	None	Minor impacts on physical road conditions due to increases in traffic at the beginning and end of each operations and outage support shifts.
Demography	SMALL	None	None
Economic Impacts on the Community	SMALL	None	None
Infrastructure and Community Services	SMALL	Implement traffic-management plan, including staggering shifts, to reduce congestion	Minor increase in traffic (i.e., congestion) at the beginning and end of shifts, especially during outage operations
Environmental Justice	SMALL	None	None
Historic and Cultural	SMALL	Implement MOA and cultural resources management plan between Duke, the USACE, South Carolina SHPO, and Catawba Indian Nation including protection of known historic properties and cultural resources, investigations prior to ground-disturbing activities and procedures for any inadvertent cultural resources discoveries	Potential for inadvertent discoveries during maintenance and operational activities

Table 10-2. (contd)

Resource Area	Impact Level	Actions to Mitigate Impacts	Unavoidable Adverse Impacts
Air Quality	SMALL	Cooling towers would be operated with drift eliminators to limit salt deposition. Operation of generators would regulated by SCDHEC air quality permits.	Impact on local aesthetics due to cooling-tower plumes, increased salt deposition in and near the site due to operation of the cooling towers. Criteria pollutants and greenhouse gas emissions from the intermittent use of standby generators and worker vehicles
Nonradiological Health	SMALL	No mitigation beyond strict adherence to NRC and OSHA safety standards	Minimal health impacts from potential exposure to etiologically agents, noise, and acute and chronic electromagnetic fields. Minimal impacts from occupational injuries and transportation of operations workers.
Radiological Health	SMALL	Doses to members of the public would be maintained below NRC and EPA standards; worker doses would be maintained below NRC limits and ALARA; doses to biota other than humans would be maintained below NCRP and IAEA guidelines	Small radiation doses to members of the public, below NRC and EPA standards; ALARA doses to workers; and biota doses less than NCRP and IAEA guidelines
Fuel Cycle (including radioactive waste), transportation, and decommissioning	SMALL[(a)]	Changes in technology are reducing impacts in fuel cycle; implement waste-minimization program; compliance with NRC and DOT regulations.	Small impacts from fuel cycle presented in Table S-3, 10 CFR Part 51. Small impacts from carbon dioxide, radon, and technecium-99. Small radiological doses within NRC and DOT regulations from transportation of fuel and radioactive waste. Small impacts from decommissioning as presented in NUREG-0586 (NRC 2002).

Table 10-2. (contd)

Resource Area	Impact Level	Actions to Mitigate Impacts	Unavoidable Adverse Impacts
Nonradioactive Waste	SMALL	Implement BMPs to minimize waste generation. Manage wastes in accordance with Federal, State, and local requirements. Comply with requirements of NPDES and air quality permits	Small quantities of solid wastes, including hazardous wastes; permitted effluents discharged to the Broad River; temporary and occasional emissions from backup generators

(a) This conclusion is conditional on the results of the ongoing rulemaking to update the Waste Confidence Decision and Rule (see Section 6.1.6).

ALARA = As Low As Reasonably Achievable
APLIC = Avian Power Line Interaction Committee
BMPs = Best Management Practices
cfs = cubic feet per second
EPA = U.S. Environmental Protection Agency
IAEA = International Atomic Energy Agency
MOA = Memorandum of Agreement
NCRP = National Council on Radiation Protection & Measurements
NPDES = National Pollutant Discharge Elimination System
OSHA = Occupation Safety and Health Administration
SCDHEC = South Carolina Department of Health and Environmental Control
SHPO = State Historic Preservation Officer
SWPPP = Stormwater Pollution Prevention Plan
USACE = U.S. Army Corps of Engineers

Consumptive water use of about 55 cfs and thermal discharge to the Broad River are unavoidable adverse impacts from operation of Lee Nuclear Station Units 1 and 2. The review team determined that 55 cfs would represent only about 3 percent of the Broad River mean annual flow, and river water temperature would increase only 1.1 and 1.2°F in January and August, respectively. Stormwater would be managed with a site-specific SWPPP and operations-related monitoring would be performed to ensure that cooling-tower blowdown would comply with requirements contained in the Lee Nuclear Station NPDES permit.

Unavoidable adverse impacts to terrestrial resources would include minor impacts of cooling towers on birds (collisions and noise) and native and ornamental vegetation (drift deposition). Additional impacts are briefly described below:

- minor impacts from transmission-line operation on birds (collisions and electrocutions) and transmission-line- and water-pipeline corridor maintenance (vegetation cutting and herbicide use) on wildlife and important habitats, including floodplains and wetlands (vegetation cutting)

- minor impacts from drawdown on existing wetlands around Make-Up Pond B and wetlands that could develop around Make-Up Pond C
- minor impacts to wildlife from increased traffic, water-treatment-basin operation, railroad-spur operation, nighttime security lighting, and electromagnetic fields
- minor impacts to habitat and wildlife from dredged material disposal.

Unavoidable adverse aquatic impacts would include impingement and entrainment loss of organisms at the Broad River and Make-Up Pond intakes, and loss of benthic organisms during dredging activities. These adverse impacts would be minimal during operation because the intake structures on Ninety-Nine Islands Reservoir and Make-Up Ponds A, B, and C, would be designed and located to minimize effects to aquatic organisms from impingement and entrainment. Aquatic impacts from station blowdown to the Ninety-Nine Islands Reservoir and the Broad River below Ninety-Nine Islands Dam also would have minimal effects to aquatic organisms because of design and placement of the discharge pipe multiport diffuser and rapid mixing of the station blowdown with the river water through Ninety-Nine Islands Dam. Operation of the intake and discharge structures would comply with the Lee Nuclear Station NPDES permit.

Unavoidable adverse socioeconomic impacts likely would be similar to those during the building phase but would be much smaller because project-related population would be smaller and much of the mitigation of housing and infrastructure shortages would have occurred in response to the larger impacts during the building period. Adverse socioeconomic impacts primarily would be increased traffic, some damage to roads, and an increase in the demand for housing and public services.

Unavoidable adverse impacts to historic and cultural resources would be insignificant under consistent implementation of the cultural resources management plan and MOA between Duke, the USACE, the South Carolina SHPO, and the Catawba Indian Nation (USACE et al. 2013). The MOA is tailored specifically for the Lee Nuclear Station and associated developments.

Unavoidable adverse air-quality impacts would be negligible and pollutants emitted during operations would be insignificant. Duke would comply with applicable air permits issued by SCDHEC. Radiological health impacts would also be minimal. Doses to members of the public and workers would be maintained below NRC and EPA standards and ALARA. Doses to biota other than humans would be maintained below NCRP and IAEA guidelines.

Nonradiological health impacts to members of the public from operation, including exposure to etiological agents, noise, electromagnetic fields, and increased impacts from transportation of materials and personnel to and from the Lee Nuclear Station site would be minimized through controls and measures by Duke associated with compliance with Federal and State regulations. Creation of solid waste and small quantities of nonhazardous waste and discharge of stormwater and cooling-tower blowdown would be small but unavoidable impacts from operation of the proposed Lee Nuclear Station Units 1 and 2. Implementation of a waste-minimization plan, including an aggressive recycling program, would reduce impacts from solid and hazardous wastes. Duke would comply with State and Federal regulations regarding waste and discharge of liquid effluents.

Impacts from the nuclear fuel cycle would be bounded by the impacts in presented in Table S–3 of 10 CFR Part 51, and are therefore small. Impacts from carbon dioxide, radon, and technetium-99 were not addressed in Table S–3; Section 6.1 of this EIS addresses those impacts and concludes that they are small. Radiological doses from transportation of fuel and radwaste would be within NRC and DOT regulations and therefore small. Impacts from decommissioning are addressed in Section 6.3 of this EIS; they are also consistent with the impacts presented in NUREG-0586, and are therefore small.

10.3 Relationship Between Short-Term Uses and Long-Term Productivity of the Human Environment

Section 102(2)(C)(iv) of NEPA requires that an EIS include information on the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity.

The local use of the human environment by the proposed project can be summarized in terms of the unavoidable adverse environmental impacts of building and operation and the irreversible and irretrievable commitments of resources. With the exception of the consumption of depletable resources as a result of plant building and operation, these uses may be classed as short-term. The principal short-term benefit of the plant is the production of electrical energy. The economic productivity of the site, when used for this purpose, would be extremely large compared to the productivity from agriculture, mining, or from other probable uses for the site.

The maximum long-term impact on productivity would result if the plant were not immediately dismantled at the end of the period of plant operation, and consequently, the land occupied by the plant structures would not be available for other uses for an extended period of time that would depend on the delay in dismantlement. However, the enhancement of regional productivity resulting from electrical-energy production by the plant is expected to result in a correspondingly large increase in regional long-term productivity that would not be equaled by other long-term uses of the site. In addition, most long-term impacts resulting from land-use preemption by plant structures can be eliminated by removing these structures or by converting them to other productive uses. Once the units are shut down, they would be decommissioned according to NRC regulations. Once decommissioning is complete and the NRC license is terminated, the site would be available for other uses.

The review team concludes that the negative aspects of plant construction, preconstruction, and operation as they affect the human environment are outweighed by the positive long-term enhancement of regional productivity through the generation of electrical energy.

10.4 Irreversible and Irretrievable Commitments of Resources

Section 102(2)(C)(v) of NEPA requires that an EIS include information on any irreversible and irretrievable commitments of resources that would occur if the proposed actions are implemented. The term “irreversible commitments of resources” refers to environmental resources that would be irreparably changed by the new units and that could not be restored at some later time to the resource’s state before the relevant activities. “Irretrievable commitments of resources” refers to materials that would be used for or consumed by the new units in such a way that they could not, by practical means, be recycled or restored for other uses. Irreversible commitments of resources are the environmental resources discussed in Chapters 4, 5, and 6 of this EIS.

10.4.1 Irreversible Commitments of Resources

Irreversible commitments of environmental resources resulting from Lee Nuclear Station Units 1 and 2, in addition to the materials used for the nuclear fuel, are described in the following sections.

10.4.1.1 Land Use

Land committed to the disposal of radioactive and nonradioactive wastes is committed to that use, and cannot be used for other purposes. The land used for the proposed Lee Nuclear Station, with the exception of any filled wetlands or waters of the United States, would not be irreversibly committed because once proposed the Lee Nuclear Station ceases operations and the plant is decommissioned in accordance with NRC requirements, the land supporting the facilities could be returned to most other industrial or nonindustrial uses. Make-Up Pond C could be drained and returned to its previous use. However, prime farmland soils inundated or otherwise disturbed to create Make-Up Pond C could be irretrievably altered.

10.4.1.2 Water Use

Under average conditions, 24,638 gpm (55 cfs) of surface water used as cooling water would be lost through evaporation (i.e., referred to as consumptive use) during operation. There would be no use of groundwater and no discharge to groundwater during operation.

10.4.1.3 Ecological Resources

Preconstruction and construction in the terrestrial environment would affect about 946 ac of terrestrial habitat on the Lee Nuclear Station site, about 1100 ac of offsite terrestrial habitat for Make-Up Pond C, and about 778 ac of offsite terrestrial habitat for the transmission lines. Some of the losses would be only temporary while facilities are under development, while other losses would be more permanent, at least for the operational life of the Lee Nuclear Station project. The specific composition of the habitat losses, as well as information on wetland losses and possible effects on important species, are provided in Section 4.3.1. Of particular note, the loss of habitat at Make-Up Pond C would permanently reduce wildlife populations in the London Creek watershed and the functionality of the watershed as a wildlife travel corridor.

Plant operations in the terrestrial environment would have the following effects. Cooling towers would have minor impacts on birds (collisions and noise) and native and ornamental vegetation (drift deposition). Transmission-line operation would have minor impacts on birds (collisions and electrocutions). Transmission-line and water-pipeline corridor maintenance (vegetation cutting and herbicide use) would have a minor impact on wildlife and important habitats, including floodplains and wetlands (vegetation cutting). Drawdown would have minor impacts on existing wetlands around Make-Up Pond B and wetlands that could develop around Make-Up Pond C. Increased traffic, water-treatment-basin operation, railroad-spur operation, nighttime security lighting, and electromagnetic fields would have minor impacts on wildlife. Disposal of dredged material would have minor impacts on habitat and wildlife.

Preconstruction and construction in the aquatic environment would result in a permanent change to an estimated 9.37 ac of open water on the Lee Nuclear Station site. Building Make-Up Pond C would result in permanent effects on an estimated 17.58 ac of open water and 64,911 linear ft of stream offsite. Additional temporary impacts would be necessary and are discussed in Section 4.3.2. Building Make-Up Pond C would fundamentally alter the physical and biological characteristics of London Creek, a tributary to the Broad River. Most lotic (stream) species in London Creek that are adapted to flowing water would be replaced with lentic (lake) species adapted to the still waters of the supplemental cooling-water reservoir. Plant operations in the aquatic environment would also affect aquatic biota, but are not expected to result in permanent change to aquatic resources. The cessation of water withdrawal from and discharge to the Broad River and Make-Up Ponds A, B, and C, and the end of transmission-line maintenance once plant operations cease, would benefit aquatic resources.

10.4.1.4 Socioeconomic Resources

The staff expects that no irreversible commitments would be made to socioeconomic resources because they would be reallocated for other purposes once the plant is decommissioned.

10.4.1.5 Historic and Cultural Resources

Cultural resource attributes would be permanently altered by the construction, preconstruction, and operation of proposed Lee Nuclear Station Units 1 and 2, Make-Up Pond C, transmission lines, and the railroad spur. Almost all impacts would be attributable to preconstruction activities, particularly those for Make-Up Pond C. The Service Family Cemetery would be relocated prior to impoundment of London Creek and inundation of the Make-Up Pond C area, permanently altering the cultural setting of this cultural resource and its relationship to regional history, settlement patterns, and the historical uses of the land. Under consistent implementation of the cultural resources management plan and MOA between Duke, the USACE, the South Carolina SHPO, and the Catawba Indian Nation (USACE et al. 2013), the staff expects no additional irreversible commitments of historic and cultural resources.

10.4.1.6 Air and Water Resources

Dust and other emissions (e.g., vehicle exhaust) would be released to the air during construction and preconstruction. During operations, vehicle exhaust emissions would continue and other air pollutants and chemicals, including very low concentrations of radioactive gases and particulates, would be released from the facility to the air and surface water. The staff expects no irreversible commitment to air or water resources because all proposed releases at Lee Nuclear Station Unit would be made in accordance with duly issued permits.

10.4.2 Irretrievable Commitments of Resources

Irretrievable commitments of resources during construction of the proposed Lee Nuclear Station generally would be similar to that of any major construction project. A study by the U.S. Department of Energy (DOE) (DOE 2004) of new reactor construction estimated that the following quantities of materials would be required for the reactor building of a typical new 1300-MW(e) nuclear power unit: 12,239 yd^3 of concrete, 3107 tons of rebar, and 6,500,000 ft of cable. An estimated additional 275,000 ft of piping would be required for a two-unit plant. A total of approximately 182,900 yd^3 of concrete and 20,512 tons of structural steel would be required to construct the reactor building, major auxiliary buildings, the turbine-generator building, and the turbine-generator pedestal. Therefore, about twice these amounts would be needed for building two units at the Lee Nuclear Station site, and more resources would be required for other site structures.

The review team expects that the use of construction materials in the quantities associated with those expected for the Lee Nuclear Station, while irretrievable, would be of small consequence with respect to the availability of such resources.

The main resource that would be irretrievably committed during operation of the new nuclear units would be uranium. The availability of uranium ore and existing stockpiles of highly enriched uranium in the United States and Russia that could be processed into fuel is sufficient (OECD NEA and IAEA 2008) so that the irreversible and irretrievable commitment of this resource would be negligible.

10.5 Alternatives to the Proposed Action

Alternatives to the proposed action are discussed in Chapter 9 of this EIS. Alternatives considered include the no-action alternative, energy-production alternatives, system-design alternatives, and alternative sites. For the purposes of evaluation undertaken by the USACE, possible alternative facility layouts on the proposed site also are addressed.

The no-action alternative, described in Section 9.1, refers to a scenario in which the NRC would deny the request for COLs or the USACE would deny Duke's permit request. In either case, construction of the two new units would not proceed as proposed. If no other power plant were built or electrical power supply strategy was implemented to replace the proposed action, the electrical capacity to be provided by the project would not become available, and the benefits (electricity generation) associated with the completed project would not occur, and the need for power would not be met. Failure to supply the needed electricity would have significant adverse impacts within the region of interest and the staff expects that the Public Service Commission of South Carolina and the North Carolina Utilities Commission would take steps to confirm that the need for power would be met.

Alternative energy sources are described in Section 9.2 of this EIS. Alternatives not requiring additional generating capacity are described in Section 9.2.1. Alternatives requiring new generating capacity, including detailed analyses of coal-fired and natural-gas-fired alternatives, are provided in Section 9.2.2. Other energy sources, including renewable energy sources, are discussed in Section 9.2.3, and a combination of energy alternatives (involving a combination of fossil fuel and renewable energy generation sources) is discussed in Section 9.2.4. The review team concluded by comparative analysis presented in Section 9.2.5 that none of the alternative power production options are environmentally preferable to the proposed action.

Alternative sites are discussed in Section 9.3 of this EIS. Cumulative impacts in the vicinity of the Lee Nuclear Station site, including the proposed Lee Nuclear Station Units 1 and 2 and Make-Up Pond C, are compared with the cumulative impacts from building and operating the same physical facilities and adequate offsite reservoirs at each of the alternative sites. Section 9.3.6 (Table 9-18) summarizes the NRC staff's characterization of cumulative impacts at the proposed and alternative sites. Based on this review, the NRC staff concludes that none of the alternative sites is environmentally preferable or obviously superior to the Lee Nuclear Station site. The NRC's determination is independent of the USACE's determination of a least environmentally damaging practicable alternative pursuant to Clean Water Act Section 404(b)(1) Guidelines. The USACE will conclude its analysis of both offsite and onsite alternatives in its Record of Decision.

Alternative system designs, focusing on alternative cooling-system designs, are discussed in Section 9.4 of this EIS. Section 9.4.1.6 details the review team's independent analysis of a combination wet/dry cooling-tower system as a way to limit consumption of cooling-water and potentially obviate the need for Make-Up Pond C. The staff determined that none of the alternative system designs are environmentally preferable to the proposed design.

10.6 Benefit-Cost Balance

A principal objective of NEPA is to require each Federal agency to consider, in its decision-making process, the environmental impacts of each proposed major action and the available alternative actions, including alternative sites. In particular, as stated below, NEPA requires all Federal agencies to the fullest extent possible provide the following:

> "(B) identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by Title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision-making along with economic and technical considerations."

However, neither NEPA nor CEQ requires the benefits and costs of a proposed action be quantified in dollars or any other common metric.

The intent of this section is not to identify and provide monetary estimates of all the potential societal benefits of the proposed project and compare these to a monetized estimate of the potential costs of the proposed project. Instead, this section focuses on monetized values for only those activities closely related to the building and operation of the proposed new units. For other benefits and costs of such magnitude or importance that their inclusion in this analysis can inform the NRC and USACE decision-making processes, the review team offers quantified assessments. This section compiles and compares the pertinent analytical conclusions reached in earlier chapters of this EIS. It gathers all of the expected impacts from building and operating the proposed Lee Nuclear Station Units 1 and 2 and aggregates them into two final categories: (1) the expected environmental costs and (2) the expected benefits to be derived from approval of the proposed action. As such, the analysis includes the costs and benefits of both preconstruction activities and NRC-authorized construction and operations activities.

Although the analysis in this section is conceptually similar to a purely economic benefit-cost analysis, which determines the net present dollar value of a given project, the intent of this section is to identify potential societal benefits of the proposed activities and compare these to the potential internal (i.e., private) and external (i.e., societal) costs of the proposed activities. The purpose is to generally inform the COL process by gathering and reviewing information that demonstrates the likelihood the benefits of the proposed activities outweigh the aggregate costs.

General issues related to Duke's financial viability are outside NRC's mission and authority, and thus are not considered in this EIS. Issues related to the financial qualifications of the applicant will be addressed in the staff's safety evaluation report. It is not possible to quantify and assign a value to all benefits and costs associated with the proposed action. This analysis, however, attempts to identify, quantify, and provide monetary values for benefits and costs when reasonable estimates are available.

Section 10.6.1 discusses the benefits associated with the proposed action. Section 10.6.2 discusses the costs associated with the proposed action. A summary of benefits is shown in Table 10-3. In accordance with NRC guidance in NUREG-1555 (NRC 2000a), internal costs of the proposed project are presented in monetary terms. Internal costs include all of the costs included in a total capital cost assessment (i.e., direct and indirect cost of construction, plus the annual costs of operation and maintenance). Section 10.6.3 provides a summary of the impact assessments, bringing previous sections together to establish a general impression of the relative magnitude of the proposed project's benefits and costs.

10.6.1 Benefits

The most apparent benefit from building and operating a power plant is that it would eventually generate power and provide thousands of residential, commercial, and industrial consumers with electricity. Maintaining an adequate supply of electricity in any given region has social and economic importance because adequate electricity is the foundation for economic stability and growth, and is fundamental to maintaining the current standard of living in the United States. Because the focus of this EIS is on the generating capacity of the proposed Lee Nuclear Station Units 1 and 2, this section focuses primarily on the relative benefits of the Lee Nuclear Station option rather than the broader, more generic benefits of electricity supply.

10.6.1.1 Societal Benefits

For the production of electricity to be beneficial to a society, a corresponding demand, or "need for power," must exist in the region. Chapter 8 defines and discusses the need for power in more detail. From a societal perspective, availability, long-term price stability, energy security, and fuel diversity are the primary benefits associated with nuclear power generation relative to most other alternative generating approaches. These benefits are described in this subsection.

Price Stability and Longevity

Because of relatively low and nonvolatile fuel costs (i.e., approximately 0.5 cents per kWh) and projected capacity utilization rate of 93 percent, nuclear energy is a dependable electricity resource that can be provided at relatively stable prices to the consumer over a long time period. Nuclear power facilities generally are not subject to fuel price volatility like natural-gas-fired and coal-fired power plants. In addition, uranium fuel constitutes only 3 to 5 percent of the cost of a kilowatt-hour (kWh) of nuclear-generated electricity. Doubling the price of uranium increases the cost of electricity by about 7 percent. Doubling the price of natural gas would add about 70 percent to the price of electricity, and doubling the cost of coal would add about 36 percent to the price of electricity (WNA 2010).

Table 10-3. Benefits of Lee Nuclear Station

Benefit Category	Description of Benefit	Value of Benefit Over License Period
	Net Electrical Generating Benefits	
Generating capacity (two plants)	Approximately 2234 MW(e)	-
Electricity generated (two plants operating at 93% capacity)	18,200,000 MWh	-
Taxes and Other Revenue During Plant Construction, Preconstruction, and Operation Period (transfer payments – not independent benefits)		
Annual property taxes	Approximately $11.8 million in fee-in-lieu-of-payments annually	$11.8 million a year
	Effects on Regional Productivity	
Construction workers	Direct Impact: Approximately 4613 workers at project peak Indirect Impact: Approximately 1991 indirect jobs supported by the direct workforce in Cherokee and York Counties	
Operational workers	Direct Impact: 957 workers added over 40-year life of plant Indirect Impact: Approximately 1115 indirect jobs supported by the direct workforce in Cherokee and York Counties	
Technical and other non-monetary benefits	Fuel diversity reduces the risk associated with reliance on any single fuel source	
Electric reliability	Enhances electric grid reliability and stability	
Price volatility	Dampens potential for fuel price volatility	

Energy Security and Fuel Diversity

Currently, more than 70 percent of the electricity generated in the United States is generated with fossil-based technologies; thus, non-fossil-based generation, such as nuclear generation, is essential to maintaining diversity in the aggregate power generation fuel mix (DOE/EIA 2011). Nuclear power contributes to the diverse U.S. energy mix, hedging the risk of shortages and price fluctuations for any one generating system and reducing national dependence on imported fossil fuels.

As described in Chapter 8 of this EIS, the NRC staff analysis of the relevant load forecasts revealed a need for power of approximately 4,300 MW in the region of interest by the year 2027. The proposed Lee Nuclear Station Units 1 and 2 would generate approximately 2234 MW(e) net, which would help meet this baseload need in the region. Assuming a reasonably low capacity factor of 85 percent, the plant's average annual electrical-energy generation would be about 16,400,000 MWh. A reasonably high-capacity factor of 93 percent would result in slightly more than 18,200,000 MWh of electricity.

10.6.1.2 Regional Benefits

Regional benefits of the building and operation of proposed Lee Nuclear Station include enhanced tax revenues, regional productivity, and community impacts.

Tax Revenue Benefits

Revenues would accrue to the State and the two-county economic impact area primarily in the form of property, income, and sales taxes over a short-term period due to building activities and over a long-term period due to operation activities. Duke (2009c) has agreed to pay Cherokee County $11.8 million annually in property taxes during the first 30 years of the operating life of the proposed Lee Nuclear Station (upon completion and operation of the proposed units).

In addition to property taxes, building-related jobs and salaries would generate State income tax revenue. The review team assumed that 70 percent of the skilled crafts workforce would relocate into the region while the plant is being built. However, impacts in the state would occur only to the degree that construction and operations workers would be relocating from out of state or when in-state workers significantly upgrade their disposable income compared to previous in-state employment. The review team concludes, when viewed in the context of total sales tax revenue to the State of South Carolina, the net impact on sales tax revenue caused by potential relocations to South Carolina, or from the effect of upgrading disposable income through better employment, would be minimal.

Sales taxes would be levied on materials purchased in-state to build proposed Lee Nuclear Station Units 1 and 2. Retail sales of tangible personal property are subject to general State sales or use taxes of 6.0 percent. In addition, the counties collect an additional 1.0 percent in local sales and use taxes, bringing the total rate to 7.0 percent.

Regional Productivity and Community Impacts

Proposed Lee Nuclear Station Units 1 and 2 would require a peak-level workforce of approximately 4613. The long-term impact would be realized from the operations employment multiplier effect which suggests that 1115 additional indirect and induced jobs would be created to support the 957 direct jobs during the operations period. The economic multiplier effect of the increased spending by the direct and indirect workforce created as a result of the proposed Lee Nuclear Station would increase the economic activity in the region, most noticeably in Cherokee

County. Sections 5.4.3.1 and 4.4.3.1 provide additional information on the economic impacts of building and operating the proposed Lee Nuclear Station.

The NRC staff's interviews in communities surrounding the Lee Nuclear Station site revealed that the public perceives Duke as a "good corporate citizen," and believes there would be a benefit to the region from the presence of significant groups of relatively well-paid and well-educated employees associated with development of a nuclear power facility. Local officials and service organization representatives all emphasized the philanthropic and service value that Duke and its employees bring to the community (NRC and PNNL 2008).

10.6.2 Costs

Internal costs to Duke, as well as external costs to the surrounding region and environment, would be incurred during preconstruction, construction, and operation of the proposed Lee Nuclear Station. Internal costs include the costs to physically construct the nuclear power facility (capital costs), as well as operating and maintenance, fuel, waste disposal, and decommissioning costs. External costs include all costs imposed on the environment and region surrounding the facility that are not internalized by the company and may include such things as a loss of regional productivity, environmental degradation, or loss of wildlife habitat. The external costs listed in Table 10-4 summarize environmental impacts to resources that could result from preconstruction, construction, and operation of proposed Lee Nuclear Station. Because Table 10-4 includes costs for preconstruction activities as well as for NRC-authorized construction and operation, the costs presented for an individual resource may be greater than the costs solely for the NRC-authorized portion of the project.

Table 10-4. Internal and External Costs of the Proposed Project

Cost Category	Description of Cost
Internal Costs	
Construction Costs (overnight cost) for both units (including preconstruction costs)	$11 billion (about $4900 per installed kW(e)) (Duke 2009c)
Transmission lines	$269 million (about $122 per installed kW(e)) (Duke 2009c)
External Costs	
Operations	1.7 to 3.7 cents per kWh (Duke 2009c) 6.6 to 11.1 cents per kWh (MIT 2009 and The Keystone Center 2007)
Fuel cost	0.45 cents per kWh (WNA 2010)
Decommissioning	Approximately $1.032 billion (Duke 2013a)

Table 10-4. (contd)

Cost Category	Description of Cost
Land and land use	MODERATE. The proposed Lee Nuclear Station Units 1 and 2 would occupy approximately 619 ac permanently and 327 ac temporarily on the 1928-ac site. Part of the land proposed to be used by new structures was cleared during previous reactor development work at the site. An additional 2110 ac of land is being purchased for the Make-Up Pond C site. Existing structures, including 86 houses, were removed. Approximately 1100 ac of the proposed Make-Up Pond C land parcel would be permanently or temporarily occupied (mostly permanent). Approximately 262 ac of prime farmland and farmland of Statewide importance could be disturbed or otherwise excluded from future agricultural use. In addition, approximately 987 ac of land would be permanently occupied by the proposed new transmission-line corridors, although agricultural land uses would be allowed in most of the right-of-way. Small areas of additional land would be occupied by the proposed railroad spur and other minor utilities. (See Sections 4.1 and 5.1.)
Hydrological and water use	SMALL. Some costs would be associated with providing water for various needs during construction, preconstruction, and operation. There would be no use of groundwater during construction, preconstruction, or operation. Cooling water would be taken from the Broad River. About 24,638 gpm (55 cfs) would be lost though evaporation. Relatively small levels of pollutants and/or radioactive effluents would be introduced into the Broad River. A small thermal plume would result from cooling-tower blowdown discharged to the Broad River. (See Sections 4.2 and 5.2.)

Table 10-4. (contd)

Cost Category	Description of Cost
Terrestrial habitats and species	MODERATE for preconstruction impacts in the terrestrial environment. Impacts at the Lee Nuclear Station site would include permanent or temporary losses of forests (approximately 423 ac of forest cleared), jurisdictional wetlands (0.21 ac of forested wetlands hand cut), and non-jurisdictional features (9.25 ac of water-filled depressions filled), as well as the temporary drawdown of 5.46 ac of jurisdictional wetlands during an approximate 3-year period. Permanent losses would occur on 0.5 ac of forest and 0.52 ac of jurisdictional wetlands would be disturbed along the railroad-spur corridor. Transmission-line corridors would permanently disturb about 690 ac of forest and affect approximately 1.15 ac of jurisdictional wetlands. Make-Up Pond C would impact about 821 ac of forest (of which about 545 ac are mixed hardwood and mixed hardwood-pine forest along London Creek and its tributaries), about 3.55 ac of jurisdictional wetlands, and about 884 linear ft of shoreline vegetation along jurisdictional streams. (See Section 4.3.1.) SMALL for operation impacts in the terrestrial environment. Minor impacts would be expected from cooling towers, transmission-line operation and transmission-line and water-pipeline corridor maintenance. Minor impacts would be expected to wetlands from drawdown of cooling-water reservoirs; minor impacts to wildlife from all other plant operations and maintenance activities. (See Section 5.3.1.)
Aquatic habitats and species	MODERATE. Preconstruction impacts in the aquatic environment include the permanent loss of 12.3 mi of lotic (flowing water) habitat and the alteration of 17.58 ac of open-water habitat within the reservoir footprint. Approximately 145 linear ft of tributaries would be permanently removed in association with installation of an enlarged replacement culvert under the existing railroad spur. An additional 9.37 ac of open-water habitat would be permanently altered (1.48 ac filled, 7.89 ac dredged) on the Lee Nuclear Station site. There would be minor and temporary impacts to aquatic resources from installing cooling-water intake and discharge systems, clearing and grading forested land, installing drainage and

Table 10-4. (contd)

Cost Category	Description of Cost
	erosion-control systems, building temporary roads and laydown yards, draining farm ponds, and adding impervious surfaces to the watershed. (See Section 4.3.2.) Temporary impacts include an additional 884 linear ft of tributaries associated with the building of Make-Up Pond C, 1345 linear ft of tributaries associated with the culvert replacement project under the existing railroad spur, and 94.68 ac of open-water habitat on the Lee Nuclear Station site. SMALL. Operation impacts in the aquatic environment include impingement and entrainment of aquatic organisms; minor physical, chemical, and thermal effects of blowdown discharge; minor impacts to aquatic biota and habitat from maintenance dredging; and limited impacts associated with maintenance of the transmission-line corridors. (See Section 5.3.2.)
Socioeconomic	The external costs of building and operating proposed Lee Nuclear Station Units 1 and 2 were discussed in detail in Sections 4.4 and 5.4. The review team determined these external costs would be SMALL, with the exception of a MODERATE impact on aesthetics and traffic during building activities near the site.
Environmental justice	SMALL. No environmental pathways were identified through which minority or low-income populations could experience a disproportionately high and adverse impact. (See Sections 4.5 and 5.5.)
Historic and cultural resources	MODERATE. The historic Service Family Cemetery would be relocated from Make-Up Pond C, which would result in irretrievable loss of the original historic setting of this resource. (See Sections 4.6 and 5.6.)
Air emissions	SMALL. Air emissions from diesel generators, auxiliary boilers and equipment, and vehicles would have a small impact on workers and local residents. Cooling-tower drift would deposit some salt on the surrounding vicinity, but at a level unlikely to result in any measurable impact on plants and vegetation. Cooling towers would produce atmospheric plume discharge. (See Sections 4.7 and 5.7.)

Table 10-4. (contd)

Cost Category	Description of Cost
Radioactive effluents and emissions	SMALL. Radioactive waste would be generated. The proposed Lee Nuclear Station would produce radioactive air emissions. Relatively small levels of radioactive liquid effluents would be introduced into the Broad River. (See Sections 4.9 and 5.9.)
Radioactive waste	SMALL.[(a)] Storage, treatment, and disposal of radioactive spent nuclear fuel. Commitment of geological resources for disposal of radioactive spent fuel. (See Section 6.1.6.)
Materials, energy, and uranium	SMALL. Irreversible and irretrievable commitments of materials and energy, including depletion of uranium.
Nonradiological health and wastes	SMALL. Nonradiological health impacts to the public and occupational workers would be SMALL; hazards would be monitored and controlled in accordance with regulatory limits. (See Sections 4.8 and 5.8.) SMALL. Creation of solid wastes, including small amounts of hazardous wastes. Permitted site stormwater releases to surface water. Minor, localized, and temporary air emissions from construction equipment and temporary stationary sources. (See Sections 4.10 and 5.10.)

(a) This conclusion is conditional on the results of the ongoing rulemaking to update the Waste Confidence Decision and Rule (see Section 6.1.6).

10.6.2.1 Internal Costs

The most substantial monetary cost associated with nuclear energy is the cost of capital. Nuclear power facilities typically have relatively high capital costs for building the facility, but very low fuel costs relative to alternative power-generation systems. Because of the large capital costs for nuclear power and the relatively long construction period before revenue is returned, servicing the capital costs of a nuclear power facility is the most important factor in determining the economic competitiveness of nuclear energy. Construction delays can add significantly to the cost of a plant. Because no new nuclear plants have been built in the United States in many years, empirical cost data are lacking and some uncertainty exists regarding the actual costs of construction.

Construction Costs

In evaluating the monetary costs related to building the proposed Lee Nuclear Station, Duke reviewed recently published literature, vendor information, and internally generated, site-specific, information. Construction-cost estimates are provided in Table 10-4. These estimates are based on a number of studies conducted by government agencies, universities, and other entities, and include a significant contingency to account for uncertainty. In its ER, Duke expressed the construction-cost estimate in terms of “overnight capital cost,” which is a commonly used approach in the construction industry. “Overnight capital cost” is a term used to describe the monetary cost of constructing large capital projects such as a power plant, where costs are exclusive of interest and escalation, but include engineering, procurement, and construction costs, as well as owner's costs and contingencies. The owner’s costs include such things as site work and preparation, cooling-water intake structures and cooling towers, import duties on components, insurance, spare parts, transmission interconnection, development costs, project management costs, owner’s engineering, State and local permitting, legal fees, and staff-related training.

The review team reviewed two additional reports. One report published by The Keystone Center entitled *Nuclear Power Joint Fact-Finding* (The Keystone Center 2007) concluded that, based on alternative discount rates and construction times, overnight construction costs range between $3600 and $4200 per kW(e). The second study is a 2009 update to an MIT study (MIT 2009) that revised capital cost estimates to $4000 per kW(e).

In its ER, Duke estimated an overnight capital cost of $11 billion to build both units (Duke 2009c), which amounts to about $4900 per kW(e) in 2008 dollars, and is consistent with other studies. An additional $269 million would be required to connect the proposed Lee Nuclear Station Units 1 and 2 to the grid.

Operational Costs

Operational costs are frequently expressed as the levelized cost of electricity, which is the lowest price per kWh of producing electricity, including the cost needed to cover operating costs and annualized capital costs. Overnight capital costs account for 33 percent of the levelized cost, and interest costs on the overnight costs account for another 25 percent (University of Chicago 2004). Levelized cost estimates based on the MIT study (MIT 2009) range from $66 to $84 per MWh (6.6 cents to 8.4 cents per kWh). However, the Keystone Study estimates the levelized cost to range from 8.3 cents to 11.1 cents per kWh (Keystone Center 2007). Factors affecting the range include choices for discount rate, construction duration, facility lifespan, capacity factor, cost of debt and equity, the split between debt and equity financing, depreciation time, tax rates, and premium for uncertainty. Estimates include decommissioning but, due to the effect of discounting a cost that would occur as much as 40 years in the future, decommissioning costs have relatively little effect on the levelized cost. Duke reviewed several studies of operations costs and estimated costs to be approximately $17 to $37 per MWh (in 2007 dollars) (Duke 2009c). The review team did not find Duke's estimates to be unreasonable approximations, based on expected costs.

Fuel Costs

The cost of fuel is included in the calculation of levelized cost. Based on a recent World Nuclear Association study (WNA 2010), the review team estimates nuclear fuel costs to be less than half a cent (i.e., 0.45 cents) per kWh.

Waste Disposal

The back-end costs of nuclear power contribute a very small share of total cost, both because of the long lifetime of a nuclear reactor and the fact that provisions for waste-related costs can be accumulated over that time. However, it should be recognized that radioactive nuclear waste also poses unique disposal challenges for long-term waste management. While spent fuel and radioactive nuclear waste are being stored successfully in onsite facilities, the United States and other countries have yet to implement final disposition of spent fuel or high-level radioactive waste streams created at various stages of the nuclear fuel cycle.

Decommissioning

The NRC has requirements for licensees at 10 CFR 50.75 to provide reasonable assurance that funds would be available for the decommissioning process. Because of the effect of discounting a cost that would occur as much as 40 years in the future, decommissioning costs have relatively little impact on the levelized cost of electricity generated by a nuclear power facility. Decommissioning costs are about 9 to 15 percent of the initial capital cost of a nuclear power facility. However, when discounted, decommissioning costs contribute only a few percent to the investment cost and even less to the generation cost. In the United States, these costs account for 0.1 to 0.2 cents per kWh, which is no more than 5 percent of the cost of the electricity produced (WNA 2010). Duke's decommissioning costs are estimated to be about $516 million per unit in 2012 dollars (Duke 2013a).

10.6.2.2 External Costs

External costs are social and/or environmental effects caused by the proposed construction, preconstruction, and operation of and generation of power by the proposed Lee Nuclear Station Units 1 and 2.

Environmental and Social Costs

The impacts of building and operating proposed the Lee Nuclear Station have been identified and analyzed in Chapters 4 and 5, and a significance level of potential adverse impacts (i.e., SMALL, MODERATE, or LARGE) has been assigned. Such impacts cannot be universally monetized. Chapter 6 similarly addresses the environmental impacts from (1) the uranium fuel cycle and solid waste management, (2) the transportation of radioactive material, and (3) the decommissioning of proposed Lee Nuclear Station. A summary of project internal and external costs is shown in Table 10-4.

Unlike generation of electricity from coal and natural gas, normal operation of a nuclear power plant does not result in significant emissions of criteria air pollutants (e.g., oxides of nitrogen or sulfur dioxide), methyl mercury, or greenhouse gases associated with global warming and climate change. Combustion-based power plants are responsible for at least 70 percent of the sulfur dioxide, at least 21 percent of nitrogen oxides, and 51 percent of the mercury emissions from industrial sources in the United States (EPA 2009), and 40 percent of the nation's carbon dioxide emissions (DOE/EIA 2011). Eighty-two percent of the electric power industry's emissions are from coal-fired plants (DOE/EIA 2008). Chapter 9 of this EIS analyzes coal-fired and natural-gas-fired alternatives to building and operating proposed Lee Nuclear Station. Air emissions from these alternatives and from nuclear power are summarized in Chapters 4, 5, and 9.

Table 10-4 summarizes the external costs (i.e., environmental impacts) associated with the preconstruction, construction, and operation of the proposed Lee Nuclear Station Units 1 and 2. Table 4-7 summarizes the impacts from construction and preconstruction. Impacts to hydrology and water use, socioeconomics (with the exception of aesthetics and traffic during building activities near the site), environmental justice, air quality, and radiological and nonradiological health would all be SMALL. Impacts from the NRC action (i.e., construction as defined in 10 CFR 51.4, and the operation of the proposed new units) would also be SMALL. The impacts to land use, terrestrial and aquatic ecology, historic and cultural resources, and aesthetics (a physical socioeconomic impact) would be MODERATE for preconstruction activities; however, impacts to these resources from the NRC portion of the project would be SMALL. For traffic near the Lee Nuclear Station site (an infrastructure socioeconomic impact), the review team determined that the combined construction and preconstruction impact would be MODERATE, and the NRC portion of the project would also have a MODERATE impact on traffic in the vicinity of the proposed Lee Nuclear Station site.

10.6.3 Summary of Benefits and Costs

Duke's business decision to pursue building proposed Lee Nuclear Station is an economic decision based on private financial factors subject to regulation by North Carolina Utility Commission and Public Service Commission of South Carolina. The internal costs to build the proposed Lee Nuclear Station appear to be substantial; however, Duke's decision to pursue this expansion is an indication that the company has already concluded that the private, or internal, benefits of the proposed facility outweigh the internal costs. Although the identified societal benefits are not specifically monetized, the review team determined that the potential societal benefits of the proposed Lee Nuclear Station are substantial. In comparison, the external socioeconomic and environmental costs imposed on the region appear to be relatively small.

Table 10-3 and Table 10-4 include summaries of both benefits and costs (internal and external) of the proposed activities at the Lee Nuclear Station site. The tables include references to other sections of this EIS when more detailed analyses and impact assessments are available for specific topics. The external costs listed in Table 10-4 summarize environmental impacts to resources that could result from construction, preconstruction, and operation of the proposed Lee Nuclear Station. Because Table 10-4 includes costs for preconstruction activities and for NRC-authorized construction and operation, the costs presented for an individual resource may be greater than the costs solely for the NRC-authorized portion of the project.

On the basis of the assessments in this EIS, the building and operation of the proposed Lee Nuclear Station, with mitigation measures identified by the review team, would accrue benefits that most likely would outweigh the economic, environmental, and social costs. For the NRC-proposed action (i.e., NRC-authorized construction and operation), the accrued benefits would also outweigh the costs of construction, preconstruction, and operation of the proposed Lee Nuclear Station units.

10.7 NRC Staff Recommendation

The NRC staff's recommendation to the Commission related to the environmental aspects of the proposed action is that the COLs should be issued.[a] The staff's evaluation of the safety and emergency preparedness aspects of the proposed action will be addressed in the staff's safety evaluation report that is anticipated to be published in as a NUREG document in 2015.

This recommendation is based on (1) the ER and the Make-Up Pond C supplement to the ER submitted by Duke (2009c, 2009b); (2) consultation with Federal, State, Tribal, and local agencies; (3) the review team's independent review; (4) the NRC staff's consideration of comments related to the environmental review that were received during the original public scoping process and the supplemental scoping process related to Make-Up Pond C, and comments on the draft EIS; and (5) the assessments summarized in this EIS, including the potential mitigation measures identified in the ER and in the EIS. In making its recommendation, the staff determined that none of the alternative sites is obviously superior to the Lee Nuclear Station site. The staff also determined that none of the energy or cooling-system alternatives assessed is obviously superior to the proposed cooling system and offsite supplemental cooling reservoir (i.e., Make-Up Pond C).

(a) As directed by the Commission in CLI-12-16 (NRC 2012h), NRC will not issue the COL prior to completion of the ongoing rulemaking to update the Waste Confidence Decision and Rule (see Section 6.1.6).

Conclusions and Recommendations

The NRC's determination is independent of the USACE's determination of whether the Lee Nuclear Station site is the least environmentally damaging practicable alternative pursuant to Clean Water Act Section 404(b)(1) Guidelines. The USACE will conclude its analysis of both offsite and onsite alternatives in its Record of Decision.

Appendix A

Contributors to the Environmental Impact Statement

Appendix A

Contributors to the Environmental Impact Statement

The overall responsibility for the preparation of this environmental impact statement was assigned to the Office of New Reactors, U.S. Nuclear Regulatory Commission (NRC). The statement was prepared by members of the Office of New Reactors with assistance from other NRC organizations, Pacific Northwest National Laboratory, the U.S. Army Corps of Engineers, and the Federal Energy Regulatory Commission.

Name	Affiliation	Function or Expertise
	NUCLEAR REGULATORY COMMISSION	
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Michelle Niemeyer		Land Use, Socioeconomics, Environmental Justice, Benefit-Cost Balance
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(a) Staff member is no longer with the Office of New Reactors, the Division of Siting and Environmental Reviews, or the NRC
(b) Pacific Northwest National Laboratory is operated by Battelle for the U.S. Department of Energy
(c) Staff member is affiliated with the Idaho National Laboratory, which is operated by Battelle for the U.S. Department of Energy

Appendix B

Organizations Contacted

Appendix B

Organizations Contacted

The following Federal, State, regional, Tribal, and local organizations were contacted during the course of the U.S. Nuclear Regulatory Commission staff's review of potential environmental impacts from the construction and operation of two new nuclear units (Units 1 and 2) at the William States Lee III Nuclear Station site in Cherokee County, South Carolina:

Advisory Council on Historic Preservation, Office of Federal Agency Programs, Washington, D.C.

Carolina Indian Heritage Association, Orangeburg, South Carolina

Catawba Indian Nation, Rock Hill, South Carolina

Cherokee County Library, Gaffney, South Carolina

Cherokee County, Gaffney, South Carolina

City of Gaffney, South Carolina

City of Gastonia, North Carolina

Eastern Band of Cherokee Indians, Cherokee, North Carolina

Eastern Shawnee Tribe of Oklahoma, Seneca, Missouri

Federal Energy Regulatory Commission, Division of Hydropower Administration & Compliance, Washington, D.C.

National Marine Fisheries Service, Southeast Regional Office, St. Petersburg, Florida

North Carolina Department of Environment and Natural Resources, Raleigh, North Carolina

North Carolina Wildlife Resources Commission, Kernersville, North Carolina

Piedmont American Indian Association, Lower Eastern Cherokee Nation South Carolina, Gray Court, South Carolina

Pine Hill Indian Community, Orangeburg, South Carolina

Seminole Tribe of Florida, Clewiston, Florida

South Carolina Department of Archives and History, Columbia, South Carolina

South Carolina Department of Commerce, Columbia, South Carolina

South Carolina Department of Health and Environmental Control, Columbia, South Carolina

South Carolina Department of Natural Resources, Columbia, South Carolina

South Carolina State Historic Preservation Office, Columbia, South Carolina

Town of Blacksburg, South Carolina

United South and Eastern Federation of Tribes, Nashville, Tennessee

U.S. Army Corps of Engineers, Charleston District, Charleston, South Carolina

U.S. Environmental Protection Agency, Region 4, Atlanta, Georgia

U.S. Fish and Wildlife Service, Southeast Region, Atlanta, Georgia

U.S. Fish and Wildlife Service, South Carolina Ecological Services Field Office, Charleston, South Carolina

York Regional Chamber of Commerce, Rock Hill, South Carolina

Appendix C

NRC and USACE Environmental Review Correspondence

Appendix C

NRC and USACE Environmental Review Correspondence

This appendix contains a chronological listing of correspondence between the U.S. Nuclear Regulatory Commission (NRC) or the U.S. Army Corps of Engineers (USACE) and Duke Energy Carolinas, LLC (Duke). Also included is correspondence related to the environmental review of Duke's application for combined licenses (COLs) and an USACE Department of the Army permit at the William States Lee III Nuclear Station (Lee Nuclear Station) site in Cherokee County, South Carolina.

All documents, with the exception of those containing proprietary information, are available electronically from the Public Electronic Reading Room found on the Internet at the following web address: http://www.nrc.gov/reading-rm.html. From this site, the public can gain access to the NRC's Agencywide Document Access and Management System (ADAMS), which provides text and image files of the NRC's public documents. The ADAMS accession numbers for each document are included below.

December 12, 2007	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, regarding Duke Energy Carolinas, LLC, William States Lee III Nuclear Station – Project Number 742, Application for Combined License for William States Lee III Nuclear Station Units 1 and 2. (Accession No. ML073510494)
December 28, 2007	Press Release No. 07-172. Lee Application for New Reactors Available on NRC Website. (Accession No. ML073620508)
January 8, 2008	Letter to Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, from Joelle Starefos, NRC, Acknowledgement of Receipt of the Combined License Application for the William States Lee III Nuclear Station Units 1 and 2 and Associated *Federal Register* Notice. (Accession No. ML073620313)
January 28, 2008	*Federal Register* Notice of Receipt and Availability of Application for a Combined License for Duke Energy Carolinas (73 FR 6218). (Accession No. ML081840077)

February 11, 2008	Letter to Lana P. Gardner, Director, Cherokee County Library, from Linda Tello, NRC, Maintenance of Reference Materials Related to the Review of the William States Lee III Combined License Application at the Cherokee County Library. (Accession No. ML080250412)
February 25, 2008	Letter to Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, from Joelle Starefos, NRC, Acceptance Review for the William States Lee III Nuclear Station Units 1 and 2 Combined License Application. (Accession No. ML080510327)
February 28, 2008	Press Release No. 08-038. NRC Dockets Application for New Reactors at Lee Site in South Carolina. (Accession No. ML080590042)
February 29, 2008	*Federal Register* Notice of Acceptance for Docketing of an Application for a Combined License for William States Lee III Units 1 and 2 (73 FR 11156). (Accession No. ML081840051)
March 14, 2008	Letter to Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Related to the Combined Operating License Application for William States Lee III Nuclear Station. (Accession No. ML080650521)
March 20, 2008	*Federal Register* Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process (73 FR 15009). (Accession No. ML080650528)
March 20, 2008	Letter to Lana P. Gardner, Director, Cherokee County Library, from Linda Tello, NRC, Maintenance of Reference Materials Related to the Review of the William States Lee III Combined License Application at the Cherokee County Library. (Accession No. ML080790619)
April 2, 2008	Letter to Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, from Joelle Starefos, NRC, William States Lee III Nuclear Station Units 1 and 2 Combined License Application Review Schedule. (Accession No. ML080920621)
April 9, 2008	E-mail to Ted Bowling, Duke, from Linda Tello, NRC, Table of [Site Audit] Information Needs and Requests for GIS Layers and Figures. (Accession No. ML081570627)

April 9, 2008	Letter to Don Klima, Director, Office of Federal Agency Programs, Advisory Council on Historic Preservation, from Richard Raione, NRC, Request for Participation in the Scoping Process for the William States Lee III Nuclear Station, Units 1 and 2 Combined Licenses Application Review. (Accession No. ML080840472)
April 9, 2008	Letter to Elizabeth Johnson, Deputy State Historic Preservation Officer, South Carolina Department of Archives and History, from Richard Raione, NRC, Request for Participation in the Scoping Process for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application Review. (Accession No. ML080840533)
April 9, 2008	Letter to Sam Hamilton, Regional Director, U.S. Fish and Wildlife Service, from Richard Raione, NRC, Request for Participation in the Environmental Scoping Process and a List of Protected Species within the Area Under Evaluation for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML080840475)
April 9, 2008	Letter to David Bernhart, Assistant Regional Administrator for Protected Species, National Marine Fisheries Service Southeast Regional Office, from Richard Raione, NRC, Request for Participation in the Scoping Process for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application Review. (Accession No. ML080850962)
April 9, 2008	Letter to Wenonah G. Haire, Tribal Historic Preservation Officer, Catawba Indian Nation, from Richard Raione, NRC, Request for Participation in the Scoping Process for the Environmental Review of the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML080840506)
April 9, 2008	Letter to Russell Townsend, Tribal Historic Preservation Officer, Eastern Band of Cherokee Indians, from Richard Raione, NRC, Request for Participation in the Scoping Process for the Environmental Review of the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML080840513)
April 9, 2008	Letter to Michelle Pounds, Chief Executive Officer, Carolina Indian Heritage Association, from Richard Raione, NRC, Request for Participation in the Scoping Process for the Environmental Review of the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML080840519)

April 9, 2008	Letter to Chief Glenna J. Wallace, Eastern Shawnee Tribe of Oklahoma, from Richard Raione, NRC, Request for Participation in the Scoping Process for the Environmental Review of the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML080840520)
April 9, 2008	Letter to Michael Cook, Executive Director, United South and Eastern Federation of Tribes, from Richard Raione, NRC, Request for Participation in the Scoping Process for the Environmental Review of the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML080840538)
April 9, 2008	Letter to Chief Gene Norris, Piedmont American Indian Association, Lower Eastern Cherokee Nation South Carolina, from Richard Raione, NRC, Request for Participation in the Scoping Process for the Environmental Review of the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML080840540)
April 9, 2008	Letter to Michelle Pounds, Representative, Pine Hill Indian Community, from Richard Raione, NRC, Request for Participation in the Scoping Process for the Environmental Review of the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML080840545)
April 11, 2008	Letter to Ron Linville, North Carolina Wildlife Resources Commission, from Richard Raione, NRC, Request for Participation in the Environmental Scoping Process for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML080880253)
April 17, 2008	Notice of Public Meeting To Discuss the Environmental Scoping Process for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application (TAC NO. RB5375). (Accession No. ML080980574)
April 28, 2008	*Federal Register* Notice of Hearing and Opportunity To Petition For Leave To Intervene (73 FR 22978). (Accession No. ML081130397)
April 28, 2008	Press Release No. 08-084. NRC Announces Opportunity to Participate in Hearing on New Reactor Application for Lee site. (Accession No. ML081190151)

May 5, 2008	Letter from David M. Bernhart, Assistant Regional Administrator for Protected Species, National Marine Fisheries Service, to Richard Raione, NRC, Endangered and Threatened Species and Critical Habitats under the Jurisdiction of the NOAA Fisheries Service for the William States Lee III Nuclear Station, Units 1 and 2. (Accession No. ML081400585)
May 12, 2008	E-mail from Rebekah Dobrasko, Review and Compliance Coordinator, South Carolina Department of Archives and History, State Historic Preservation Office, to Richard Raione and Linda Tello, NRC, SHPO Comments on Lee Nuclear Plant, Cherokee County, SC (Accession No. ML081510939)
May 13, 2008	Letter from Timothy N. Hall, Field Supervisor, U.S. Fish and Wildlife Service, to Richard Raione, NRC, William States Lee, III, Nuclear Station, Combined License Application County, Cherokee County, SC, FWS Log No. 42410-2008-SL-0407. (Accession No. ML081430228)
May 20, 2008	E-mail from Christopher Goudreau, Special Projects Coordinator, North Carolina Wildlife Resources Commission, to NRC, Duke Energy Carolina, LLC, William States Lee III Combined License Application; Notice of Intent To Prepare an Environmental Impact Statement and Conduct Scoping Process. (Accession No. ML081430390)
May 20, 2008	Letter from Robert D. Perry, Director, Office of Environmental Programs, South Carolina Department of Natural Resources, to Linda Tello, NRC, William States Lee III Nuclear Station – Project 0742. (Accession No. ML081430553)
May 21, 2008	Letter from Timothy N. Hall, Field Supervisor, U.S. Fish and Wildlife Service, to Richard Raione, NRC, William States Lee, III, Nuclear Station, Combined License Application, Cherokee County, SC, FWS Log No. 42410-2008-FA-0210. (Accession No. ML081540399)
May 28, 2008	Summary of Public Scoping Meeting Conducted Related to the Review of the William States Lee III, Units 1 and 2 Combined License Application. (Accession No. ML081420057)
May 29, 2008	Letter to Leigh Ann Turner, Gaffney City Hall, from Linda Tello, NRC, Thank You for Hosting the Discussion with the NRC in Advance of the Formal Environmental Scoping Public Meeting. (Accession No. ML081420812)

May 30, 2008	E-mail from Rebekah Dobrasko, Review and Compliance Coordinator, South Carolina Department of Archives and History, State Historic Preservation Office, to Linda Tello, NRC, Duke Energy's Lee Nuclear Plant, Cherokee County, SC. (Accession No. ML081510453)
June 4, 2008	Letter to Willard Steele, Tribal Historic Preservation Officer, Seminole Tribe of Florida, from Richard Raione, NRC, Request for Participation in the Scoping Process for the Environmental Review of the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML081430691)
June 9, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Information Needs. (Accession No. ML081640362)
June 11, 2008	Letter from Wenonah G. Haire, Tribal Historic Preservation Officer, Catawba Indian Nation, to NRC, Request for Participation in the Scoping Process for the Environmental Review of the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML081750079)
June 17, 2008	Correction to *Federal Register* Notice of Hearing and Opportunity To Petition For Leave To Intervene (73 FR 34348). (Accession No. ML081420185)
June 19, 2008	Letter to Julie Holling, National Heritage Program, South Carolina Department of Natural Resources, from Richard Raione, NRC, Request for Participation in the Scoping Process and List of Rare, Threatened, or Endangered Species for the Environmental Review for the William States Lee III Units 1 and 2 Combined License Application. (Accession No. ML081420749)
July 8, 2008	Letter from Julie Holling, Heritage Trust Program, South Carolina Department of Natural Resources, to Richard Raione, NRC, Request for Participation in the Scoping Process and List of Rare, Threatened, or Endangered Species for the Environmental Review for the William States Lee III Units 1 and 2 Combined License Application. (Accession No. ML081990424)
August 5, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Environmental Audit Information Needs. (Accession No. ML082200543)

August 18, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Information Needs Ltr # WLG2008.08-02. (Accession No. ML082340082)
August 21, 2008	Letter to Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, from Jessie Muir, NRC, Request for Additional Information Regarding the Environmental Review of the Combined License Application for William States Lee III Nuclear Station, Units 1 and 2. (Accession No. ML082200509)
September 11, 2008	Scoping Summary Report Related to the Environmental Scoping Process for the William States Lee III, Units 1 and 2 Combined License Application. (Accession No. ML082390635)
September 17, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.09-04. (Accession No. ML082630569)
September 17, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.09-05. (Accession No. ML082890448)
September 19, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Environmental Audit Information Needs, Letter No. WLG2008.08-08. (Accession No. ML082670803)
September 26, 2008	Summary of the Environmental Site Audit Related to the Review of the Combined Operating License Application for William States Lee III, Units 1 and 2. (Accession No. ML082210154)
September 26, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.09-11. (Accession No. ML082750078)
October 3, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.10-01. (Accession No. ML082890505)
October 10, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.10-04. (Accession No. ML082900340)

October 17, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.10-08. (Accession No. ML083010443)
October 17, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.10-07. (Accession No. ML083050603)
October 28, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.10-13. (Accession No. ML083080273)
November 4, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Duke Energy Carolinas 2008 Integrated Resource Plan Ltr # WLG2008.11-02. (Accession No. ML083110471)
November 12, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.11-14. (Accession No. ML083220435)
November 20, 2008	Letter from Tyler Howe, Tribal Historical Preservation Specialist, Eastern Band of Cherokee Indians, to NRC, Comments Related to the Review of the Combined License Application for Williams States Lee II, Units 1 and 2. (Accession No. ML083370297)
November 20, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.11-19. (Accession No. ML083659339)
November 20, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.11-20. (Accession No. ML083310541)
November 24, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.11-22. (Accession No. ML090500256)
November 24, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.11-24. (Accession No. ML083330445)

November 25, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.11-26. (Accession No. ML083360040)
November 25, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.11-28. (Accession No. ML083520465)
December 3, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.12-04. (Accession No. ML083440293)
December 9, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.12-10. (Accession No. ML083460113)
December 11, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.12-09. (Accession No. ML083510881)
December 11, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.12-12. (Accession No. ML083510884)
December 11, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.12-14. (Accession No. ML083520210)
December 12, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.12-11. (Accession No. ML083510883)
December 17, 2008	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2008.12-17. (Accession No. ML083520212)
January 21, 2009	Letter to Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, from Linda Tello, NRC, Request for Additional Information Regarding the Environmental Review of the Combined License Application for William States Lee III Nuclear Station, Units 1 and 2. (Accession No. ML083120589)

February 10, 2009	Letter from Lieutenant Colonel J. Richard Jordan III, U.S. Army, District Commander, USACE, Charleston District, to Linda Tello, NRC, Request to Serve as a Cooperating Agency in the Preparation of the EIS. (Accession No. ML090690283)
February 16, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.2-04. (Accession No. ML090490679)
February 16, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.2-05. (Accession No. ML090490676)
February 16, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.2-06. (Accession No. ML090490675)
February 19, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.2-08. (Accession No. ML090540808)
February 19, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.2-09. (Accession No. ML090540474)
February 19, 2009	Letter from Wenonah G. Haire, Tribal Preservation Officer, Catawba Indian Nation, to Linda Tello, NRC, Request for Additional Info Regarding the Environmental Review of the Combined License Application for William States Lee III Nuclear Station, Units 1 and 2. (Accession No. ML090840061)
February 26, 2009	Letter to Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, from Robert Schaaf, NRC, Change in Schedule of William States Lee III Nuclear Station, Units 1 and 2 Combined License Application Environmental Review. (Accession No. ML090420471)
March 6, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.03-03. (Accession No. ML090690536)

March 6, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.03-04. (Accession No. ML090690543)
March 6, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.03-05. (Accession No. ML090690545)
March 9, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.03-07. (Accession No. ML090700542)
March 9, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.03-02. (Accession No. ML090700576)
March 18, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.03-08. (Accession No. ML090790309)
March 18, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.03-14. (Accession No. ML090790314)
March 18, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.03-15. (Accession No. ML090790312)
March 19, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.03-17. (Accession No. ML090830501)
March 30, 2009	Letter to Lieutenant Colonel J. Richard Jordan III, U.S. Army, District Commander, USACE, Charleston District, from Scott Flanders, NRC, Request to Cooperate with the NRC on the Environmental Impact Statement for the William States Lee III Nuclear Power Station, Units 1 and 2, Combined License Application. (Accession No. ML090700384)

March 30, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Revision 1 to the Environmental Report (Part 3) and Revision 2 to Withheld Information (Part 9) for William States Lee III Nuclear Station Units 1 and 2 Combined License Application. (Accession No. ML090990081)
April 14, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.04-01. (Accession No. ML091060497)
April 14, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Review Guide for Part 3, Environmental Report, Revision 1, and Part 9, Withheld Information, Revision, Letter No. WLG2009.04-02. (Accession No. ML091060500)
April 28, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.04-05. (Accession No. ML091200383)
April 29, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.04-06. (Accession No. ML091200570)
May 5, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Thermal Discharge Modeling, Letter No. WLG2009.05-01. (Accession No. ML091280032)
May 12, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, to NRC, Response to Request for Additional Information, Letter No. WLG2009.05-02. (Accession No. ML091340476)
July 31, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.08-01. (Accession No. ML092170642)
July 31, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Supplemental Information Addressing Hydrology Associated with Off-Site Water Storage, Letter No. WLG2009.07-08. (Accession No. ML092230151)

August 14, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.08-06. (Accession No. ML092310276)
August 18, 2009	Letter to Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, from Robert Schaaf, NRC, Environmental Project Manager Change for the Combined Licenses Environmental Review for William States Lee III Nuclear Station, Units 1 and 2. (Accession No. ML092240458)
September 4, 2009	Letter to Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, from Robert Schaaf, NRC, Update on the William States Lee III Nuclear Station Units 1 and 2 Combined License Application Environmental Review. (Accession No. ML092170267)
September 14, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.09-03. (Accession No. ML092580475)
September 14, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.09-04. (Accession No. ML092580474)
September 14, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, 2009 Integrated Resource Plan, Letter No. WLG2009.09-02. (Accession No. ML092590318)
September 23, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.09-07. (Accession No. ML092710039)
September 23, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.09-08. (Accession No. ML092710471)
September 24, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.09-06. (Accession No. ML092710228)
September 24, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.09-10. (Accession No. ML092730480)

September 24, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.09-05. (Accession No. ML092810255)
September 24, 2009	Supplement to Revision 1 of the William States Lee III Nuclear Station COL Application, Part 3; Construction and Operation of Make-Up Pond C. (Accession No. ML092810257)
October 16, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.10-01. (Accession No. ML092930116)
November 2, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.11-01. (Accession No. ML093130451)
November 11, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.11-03. (Accession No. ML093170198)
December 3, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.12-01. (Accession No. ML093380647)
December 3, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2009.12-04. (Accession No. ML093420405)
December 11, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, to NRC, Response to Request for Additional Information, Letter No. WLG2009.12-05. (Accession No. ML093490247)
December 11, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Updated Information Addressing Hydrology Associated with Off-Site Water Storage, Letter No. WLG2009.12-03. (Accession No. ML093490765)
December 11, 2009	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, to NRC, Response to Request for Additional Information, Letter No. WLG2009.12-07. (Accession No. ML093491111)

January 5, 2010	Letter to Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, from Frank Akstulewicz, NRC, Duke Energy Carolinas, LLC William States Lee III Nuclear Station Units 1 and 2 Combined Application License Review Schedule. (Accession No. ML092660080)
January 8, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.01-01. (Accession No. ML100120287)
March 31, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Editorial Text Changes to the Environmental Report, Letter No. WLG2010.03-09. (Accession No. ML100920024)
April 14, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, 2009 Integrated Resource Plan, Revision 1, Letter No. WLG2010.04-03. (Accession No. ML101090314)
May 18, 2010	Letter to Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, from Scott Flanders, NRC, Notice of Intent to Conduct Supplemental Scoping Related to the Combined License Application for William States Lee III Nuclear Station. (Accession No. ML093420654)
May 24, 2010	*Federal Register* Notice of Intent To Conduct a Supplemental Scoping Process for the Supplement to the Environmental Report (75 FR 28822). (Accession No. ML093430226)
May 24, 2010	Letter to Caroline Dover Wilson, South Carolina Department of Archives and History, State Historic Preservation Office, from Robert Schaaf, NRC, Request for Participation in a Supplemental Scoping Process Regarding the Addition of a Third Cooling Water Reservoir for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML093480445)
May 24, 2010	Letter to Don Klima, Director, Office of Federal Agency Programs, Advisory Council on Historic Preservation, from Robert Schaaf, NRC, Request for Participation in a Supplemental Scoping Process Regarding the Addition of a Third Cooling Water Reservoir for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML093560024)

May 24, 2010	Letter to Robert D. Perry, Director, Office of Environmental Programs, South Carolina Department of Natural Resources, from Robert Schaaf, NRC, Request for Participation in a Supplemental Scoping Process Regarding the Addition of a Third Cooling Water Reservoir for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application (DNR Project 0742). (Accession No. ML093570175)
May 24, 2010	Letter to Jay B. Herrington, Field Supervisor, U.S. Fish and Wildlife Service, South East Region, from Robert Schaaf, NRC, Request for Participation in a Supplemental Scoping Process Regarding the Addition of a Third Cooling Water Reservoir for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML093580019)
May 24, 2010	Letter to Ron Linville, North Carolina Wildlife Resources Commission, from Robert Schaaf, NRC, Request for Participation in a Supplemental Scoping Process Regarding the Addition of a Third Cooling Water Reservoir for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML101190491)
May 24, 2010	Letter to Susan Turner, Regional Director, South Carolina Department of Health and Environmental Control, from Robert Schaaf, NRC, Request for Participation in a Supplemental Scoping Process Regarding the Addition of a Third Cooling Water Reservoir for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML101190500)
May 24, 2010	Letter to Ramona McConney, National Environmental Policy Act Program Office, U.S. Environmental Protection Agency, Region 4, from Robert Schaaf, NRC, Request for Participation in a Supplemental Scoping Process Regarding the Addition of a Third Cooling Water Reservoir for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML101200120)
May 24, 2010	Letter to Wenonah G. Haire, Tribal Historic Preservation Officer, Catawba Indian Nation, from Robert Schaaf, NRC, Request for Participation in a Supplemental Scoping Process Regarding the Addition of a Third Cooling Water Reservoir for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML101200150)

May 24, 2010	Letter to Willard Steele, Tribal Historic Preservation Officer, Seminole Tribe of Florida, from Robert Schaaf, NRC, Request for Participation in a Supplemental Scoping Process Regarding the Addition of a Third Cooling Water Reservoir for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML101200368)
May 24, 2010	Letter to Russell Townsend, Tribal Historic Preservation Officer, Eastern Band of Cherokee Indians, from Robert Schaaf, NRC, Request for Participation in a Supplemental Scoping Process Regarding the Addition of a Third Cooling Water Reservoir for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML101200371)
May 24, 2010	Letter to Chief Glenna J. Wallace, Eastern Shawnee Tribe of Oklahoma, from Robert Schaaf, NRC, Request for Participation in a Supplemental Scoping Process Regarding the Addition of a Third Cooling Water Reservoir for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML101200375)
May 24, 2010	Letter to Michelle Pounds, Chief Executive Officer, Carolina Indian Heritage Association, from Robert Schaaf, NRC, Request for Participation in a Supplemental Scoping Process Regarding the Addition of a Third Cooling Water Reservoir for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML101200416)
May 24, 2010	Letter to Michael Cook, Executive Director, United South and Eastern Federation of Tribes, from Robert Schaaf, NRC, Request for Participation in a Supplemental Scoping Process Regarding the Addition of a Third Cooling Water Reservoir for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML101200435)
May 24, 2010	Letter to Chief Gene Norris, Piedmont American Indian Association, Lower Eastern Cherokee Nation of South Carolina, from Robert Schaaf, NRC, Request for Participation in a Supplemental Scoping Process Regarding the Addition of a Third Cooling Water Reservoir for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML101200443)

May 24, 2010	Letter to Michelle Pounds, Representative, Pine Hill Indian Community, from Robert Schaaf, NRC, Request for Participation in a Supplemental Scoping Process Regarding the Addition of a Third Cooling Water Reservoir for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML101200452)
May 25, 2010	Letter to Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, from Sarah Lopas, NRC, NRC Web Address Correction to the May 18, 2010, *Federal Register* Notice for William States Lee III Nuclear Station, Units 1 and 2 Supplemental Scoping Process. (Accession No. ML101440498)
May 26, 2010	Press Release No. 10-094. NRC Seeking Additional Environmental Scoping Comments Regarding Lee New Reactor Application, Meeting June 17. (Accession No. ML101460482)
May 27, 2010	Forthcoming Meeting to Discuss the Scoping Process for the Supplemental Environmental Report Regarding Make-Up Pond C for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML101450144)
May 27, 2010	Letter to Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, from Robert Schaaf, NRC, Environmental Project Manager Change for the Combined License Environmental Review for William States Lee III Nuclear Station, Units 1 and 2. (Accession No. ML101330578)
June 1, 2010	*Federal Register* Notice of Intent; Correction (75 FR 30451). (Accession No. ML101450180)
June 11, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information (ER RAI 119, Supplement E), Letter No. WLG2010.06.02. (Accession No. ML101650706)
June 11, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Corrected Information Addressing Existing Land Use in York County, South Carolina, Letter No. WLG2010.06-03. (Accession No. ML101650529)

June 21, 2010	E-mail from Caroline Dover Wilson, South Carolina Dept. of Archives and History, State Historic Preservation Office, to NRC, Lee Nuclear Station, Pond C, Cherokee County, South Carolina. (Accession No. ML101720651)
June 22, 2010	Letter to Bryan J. Dolan, Vice President Nuclear Plant Development, Duke, from Sarah Lopas, NRC, Request for Additional Information Regarding the Supplement to the Environmental Report for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML101370398)
June 23, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.06-05. (Accession No. ML101800213)
June 25, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.06-06. (Accession No. ML101810147)
July 1, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.07-01. (Accession No. ML101880072)
July 2, 2010	Summary of Supplemental Environmental Scoping Meeting Conducted Related to the Combined License Application Review of the William States Lee III Nuclear Station, Units 1 and 2. (Accession No. ML101800406)
July 7, 2010	Summary of Teleconference Held on June 15, 2010, between NRC and Duke Concerning Request For Additional Information Regarding Make-Up Pond C for the William States Lee III Nuclear Station, Units 1 and 2. (Accession No. ML101870564)
July 9, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.07-03. (Accession No. ML101950211)
July 9, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Conforming Changes to Environmental Report Based on Supplemental Response to Request for Additional Information, Letter No. WLG2010.07-04. (Accession No. ML101940026)

July 16, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.07-06. (Accession No. ML102100214)
July 16, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.07-07. (Accession No. ML102020479)
July 22, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.07-08. (Accession No. ML102070357)
July 22, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.07-09. (Accession No. ML102090223)
July 22, 2010	Letter from Wenonah G. Haire, Tribal Historic Preservation Officer, Catawba Indian Nation, to Scott Flanders, NRC, THPO# 2010-229-1, Project Description: Notice of Intent to Conduct Supplemental Scoping Related to the Combined License Application for William States III Nuclear Station. (Accession No. ML102110494)
July 27, 2010	Letter from Vivianne Vejdani, Nuclear Projects Coordinator, South Carolina Department of Natural Resources, to NRC, William States Lee III Nuclear Station Combined License Application Notice of Intent to Conduct a Supplemental Scoping Process for the Supplement to the Environmental Report. (Accession No. ML102160393)
July 30, 2010	E-mail to Robert Wylie, Duke, from Sarah Lopas, NRC, Pond C Audit Info Needs. (Accession No. ML102110501)
September 7, 2010	Letter from Bryan J. Dolan, Vice President Nuclear Plant Development, Duke, to NRC, Information Omitted from Response to Environmental Report RAI 192, Letter No. WLG2010.09-01. (Accession No. ML102530391)
September 14, 2010	Letter to Bryan J. Dolan, Vice President Nuclear Plant Development, Duke, from Sarah Lopas, NRC, Follow-Up Requests for Additional Information Regarding the Supplement to the Environmental Report for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML102371163)

September 28, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.09-08. (Accession No. ML102740485)
September 30, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.09-10. (Accession No. ML102780268)
October 6, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.10-01. (Accession No. ML102810637)
October 6, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.10-02. (Accession No. ML102850208)
October 14, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.10-04. (Accession No. ML103360419)
October 14, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.10-05. (Accession No. ML102920172)
October 14, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, 2010 Integrated Resource Plan, Letter No. WLG2010.10-07. (Accession No. ML102980231)
October 29, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.10-09. (Accession No. ML103070311)
November 4, 2010	Notice of Forthcoming Public Teleconference with Duke Energy Carolinas, LLC, to Discuss a Request for Additional Information Response for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application Environmental Review. (Accession No. ML103070537)
November 12, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2010.11-02. (Accession No. ML103210413)

November 19, 2010	Letter to Sandra J. Threatt, Manager, Nuclear Response and Emergency Environmental Surveillance, Bureau of Land and Waste Management, South Carolina Department of Health and Environmental Control, from Brian Hughes, NRC, Response to e-mail from Ms. Threatt dated October 25, 2010, regarding environmental monitoring around the proposed William States Lee III Nuclear Station, Units 1 and 2. (Accession No. ML103150012)
December 17, 2010	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Responses to Request for Additional Information, Letter No. WLG2010.12-01. (Accession No. ML103550032)
December 21, 2010	Site Audit Summary of William States Lee III Nuclear Station, Units 1 and 2, Supplemental Environmental Report Regarding Make-Up Pond C, and Alternative Sites Tour. (Accession No. ML102640559)
December 22, 2010	Summary Report for the Supplemental Environmental Scoping Process for the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML103220015)
January 11, 2011	Letter to Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, from David Matthews, NRC, William States Lee III Nuclear Station, Units 1 and 2 Combined License Application – Revised Review Schedule. (Accession No. ML103370325)
January 25, 2011	Summary of Public Teleconference Held on November 17, 2010, Between the U.S. Nuclear Regulatory Commission and Duke Energy Carolinas, LLC, Regarding the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application Environmental Review. (Accession No. ML103630488)
January 26, 2011	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Responses to Request for Additional Information, Letter No. WLG2011.01-03. (Accession No. ML110310017)
February 4, 2011	Letter to Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, from Sarah Lopas, NRC, Request for Additional Information Regarding the Environmental Review of the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML110140852)

February 10, 2011	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information (ER RAI 135), Letter No. WLG2011.02-03. (Accession No. ML110450507)
March 7, 2011	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2011.03-01. (Accession No. ML110700592)
March 14, 2011	Letter to Dr. Wenonah G. Haire, Tribal Historic Preservation Officer, Catawba Indian Nation, from Allen Fetter, NRC, Cultural Resources Information Related to the William States Lee Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML103000023)
March 17, 2011	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Response to Request for Additional Information (ER RAI 135), Letter No. WLG2011.03-02. (Accession No. ML110800094)
March 17, 2011	Letter from Bryan J. Dolan, Vice President, Nuclear Plant Development, Duke, to NRC, Supplemental Response to Requests for Additional Information (ER RAIs 70 and 189), Letter No. WLG2011.03-08. (Accession No. ML110830912)
May 4, 2011	Letter from Ronald A. Jones, Senior Vice President, Nuclear Plant Development, Duke, to NRC, Supplemental Response to Request for Additional Information (ER RAI 23), Letter No. WLG2011.05-01. (Accession No. ML11129A054)
May 20, 2011	E-mail to Robert Wylie, Duke, from Sarah Lopas, NRC, Lee Alternatives Audit Information Needs. (Accession No. ML111400413)
May 25, 2011	Letter to Julie Holling, South Carolina Department of Natural Resources, Heritage Trust Program, from James A. Becker, Pacific Northwest National Laboratory, Request for Federally Listed Species, State Ranked Species, and Community Element Occurrences for the Environmental Review of the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML111470774)

May 25, 2011	Letter to Harry LeGrand, North Carolina Department of Environment and Natural Resources, Heritage Trust Program, from James A. Becker, Pacific Northwest National Laboratory, Request for Federally Listed Species, State Ranked Species, and Community Element Occurrences for the Environmental Review of the William States Lee III Nuclear Station Units 1 and 2 Combined License Application. (Accession No. ML114470794)
June 7, 2011	Summary of teleconference held on May 3, 2011, between NRC and Duke, Regarding the William States Lee Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML111400028)
June 8, 2011	E-mail from Julie Holling, South Carolina Department of Natural Resources, Regarding Request for Federally Listed Species, State Ranked Species, and Community Element Occurrences for the Lee Nuclear Station and Alternative Sites. (Accession No. ML111741378)
June 16, 2011	Letter from Ronald A. Jones, Senior Vice President, Nuclear Development, Duke, to NRC, Responses to Request for Additional Information, Letter No. WLG2011.06-03. (Accession No. ML11172A288)
June 16, 2011	Letter from Ronald A. Jones, Senior Vice President, Nuclear Development, Duke, to NRC, Supplemental Response to Request for Additional Information (ER RAI 63), Letter No. WLG2011.06-05. (Accession No. ML11172A315)
June 23, 2011	E-mail from John Finnegan, North Carolina Department of Environment and Natural Resources, Regarding Request for Federally Listed Species, State Ranked Species, and Community Element Occurrences for Perkins Alternative Site. (Accession No. ML111741383)
June 23, 2011	Letter from Ronald A. Jones, Senior Vice President, Nuclear Development, Duke, to NRC, Responses to Request for Additional Information, Letter No. WLG2011.06-04. (Accession No. ML11179A079)
July 5, 2011	Letter from Ronald A. Jones, Senior Vice President, Nuclear Development, Duke, to NRC, Responses to Request for Additional Information, Letter No. WLG2011.07-02. (Accession No. ML11195A165)

July 8, 2011	Letter from Ronald A. Jones, Senior Vice President, Nuclear Development, Duke, to NRC, Responses to Request for Additional Information, Letter No. WLG2011.07-04. (Accession No. ML1119A0082)
August 4, 2011	Letter from Ronald A. Jones, Senior Vice President, Nuclear Development, Duke, to NRC, Response to Request for Additional Information, Letter No. WLG2011.08-01. (Accession No. ML112220296)
September 13, 2011	Letter from Tyler B. Howe, Tribal Historic Preservation Specialist, Eastern Band of Cherokee Indians, to NRC, Comments regarding proposed Duke Energy William States Lee III Nuclear Station, Cherokee and Union Counties, South Carolina. (Accession No. ML112570445)
September 15, 2011	Letter from Ronald A. Jones, Senior Vice President, Nuclear Development, Duke, to NRC, 2011 Integrated Resource Plan, Lt# WLG2011.09-04. (Accession No. ML11262A205)
October 3, 2011	Letter to Ronald A. Jones, Senior Vice President, Nuclear Development, from David B. Matthews, NRC, William States Lee III Nuclear Station, Units 1 and 2 Combined License Application Review Schedule Revision. (Accession No. ML11224A216)
October 4, 2011	E-mail to Thomas J. LoVullo, Chief, Aquatic Resources Branch, Division of Hydropower Administration and Compliance, U.S. Federal Energy Regulatory Commission, from Sarah Lopas, NRC, Participating Agency Invitation for the Lee Nuclear Station Environmental Review. (Accession No. ML112790295)
October 5, 2011	Letter from Thomas J. LoVullo, Chief, Aquatic Resources Branch, Division of Hydropower Administration and Compliance, U.S. Federal Energy Regulatory Commission, to Allen H. Fetter, NRC, Project No. 2331—South Carolina, Ninety-Nine Islands Project, Duke Energy. (Accession No. ML112790296)
October 18, 2011	Summary of William States Lee III Nuclear Station, Units 1 and 2, Cooling System and Energy Alternatives Audit. (Accession No. ML112760826)

December 12, 2011	Letter from Lieutenant Colonel Edward P. Chamberlayne, Commander and District Engineer, U.S. Army, to William Burton, NRC, Draft Environmental Impact Statement for Combined Licenses for William States Lee III Nuclear Station Units 1 and 2. (Accession No. ML12108A192)
December 12, 2011	Letter to Ronald A. Jones, Senior Vice President, Nuclear Development, from William F. Burton, NRC, Notice of Availability of the Draft Environmental Impact Statement for William States Lee III Nuclear Station Units 1 and 2 Combined Licenses Application Review. (Accession No. ML112940260)
December 12, 2011	*Federal Register* Notice of Availability of the Draft Environmental Impact Statement for Combined Licenses for Units 1 and 2 at the Williams States Lee III Nuclear Station Site (76 FR 79228). (Accession No. ML112940305)
December 12, 2011	Letter to U.S. Environmental Protection Agency, Office of Federal Activities, NEPA Compliance Division, from William F. Burton, NRC, Submittal of the Draft Environmental Impact Statement for the William States Lee III Nuclear Station Units 1 and 2 Combined Licenses Application Review. (Accession No. ML112940233)
December 12, 2011	Letter to Ramona McConney, NEPA Program Office, U.S. Environmental Protection Agency, from William F. Burton, NRC, Request for Comments on the Draft Environmental Impact Statement for the William States Lee III Nuclear Station Units 1 and 2 Combined License Application Review. (Accession No. ML11319A023)
December 12, 2011	Letter to Reid Nelson, Director, Office of Federal Agency Programs, Advisory Council on Historic Preservation, from William F. Burton, NRC, Request for Comments on the Draft Environmental Impact Statement for the William States Lee III Nuclear Station Units 1 and 2 Combined License Application Review. (Accession No. ML11332A003)
December 12, 2011	Letter to Jay B. Herrington, U.S. Fish and Wildlife Service, from William F. Burton, NRC, Request for Comments on the Draft Environmental Impact Statement for the William States Lee III Nuclear Station Units 1 and 2 Combined License Application Review. (Accession No. ML11332A001)

December 12, 2011	Letter to Russell Townsend, Tribal Historic Preservation Officer, Eastern Band of the Cherokee Indians, from William F. Burton, NRC, Notification of the Issuance of the Draft Environmental Impact Statement for the William States Lee III Nuclear Station Units 1 and 2 Combined Licenses Application Review. (Accession No. ML11332A006)
December 12, 2011	Letter to Wenonah G. Haire, Tribal Historic Preservation Officer, Catawba Indian Nation, from William F. Burton, NRC, Notification of the Issuance of the Draft Environmental Impact Statement for the William States Lee III Nuclear Station Units 1 and 2 Combined Licenses Application Review. (Accession No. ML11332A005)
December 12, 2011	Letter to Michael Cook, Executive Director, United South and Eastern Federation of Tribes, from William F. Burton, NRC, Notification of the Issuance of the Draft Environmental Impact Statement for the William States Lee III Nuclear Station Units 1 and 2 Combined Licenses Application Review. (Accession No. ML11332A061)
December 12, 2011	Letter to Michelle Pounds, Chief Executive Office, Carolina Indian Heritage Association, from William F. Burton, NRC, Notification of the Issuance of the Draft Environmental Impact Statement for the William States Lee III Nuclear Station Units 1 and 2 Combined Licenses Application Review. (Accession No. ML11332A004)
December 12, 2011	Letter to Willard Steele, Tribal Historic Preservation Officer, Seminole Tribe of Florida, from William F. Burton, NRC, Notification of the Issuance of the Draft Environmental Impact Statement for the William States Lee III Nuclear Station Units 1 and 2 Combined Licenses Application Review. (Accession No. ML11332A104)
December 12, 2011	Letter to Chief Glenna J. Wallace, Eastern Shawnee Tribe of Oklahoma, from William F. Burton, NRC, Notification of the Issuance of the Draft Environmental Impact Statement for the William States Lee III Nuclear Station Units 1 and 2 Combined Licenses Application Review. (Accession No. ML11332A007)
December 12, 2011	Letter to Chief Gene Norris, Piedmont American Indian Association, from William F. Burton, NRC, Notification of the Issuance of the Draft Environmental Impact Statement for the William States Lee III Nuclear Station Units 1 and 2 Combined Licenses Application Review. (Accession No. ML11332A008)

December 12, 2011	Letter to Michelle Pounds, Representative, Pine Hill Indian Community, from William F. Burton, NRC, Notification of the Issuance of the Draft Environmental Impact Statement for the William States Lee III Nuclear Station Units 1 and 2 Combined Licenses Application Review. (Accession No. ML11332A011)
December 12, 2011	Letter to Rebekah Dobrasko, State Historic Preservation Office, South Carolina Department of Archives and History, from William F. Burton, Notification of the Issues of the Draft Environmental Impact Statement for the William States Lee III Nuclear Station Units 1 and 2 (Accession No. ML11332A002)
December 12, 2011	Letter to Robert D. Perry, Director, Office of Environmental Programs, South Carolina Department of Natural Resources, from William F. Burton, NRC, Request for Comments on the Draft Environmental Impact Statement for the William States Lee III Nuclear Station Units 1 and 2 Combined License Application Review. (Accession No. ML11314A229)
December 12, 2011	Letter to Susan Turner, Regional Director, South Carolina Department of Health and Environmental Control, from William F. Burton, NRC, Request for Comments on the Draft Environmental Impact Statement for the William States Lee III Nuclear Station Units 1 and 2 Combined License Application Review. (Accession No. ML11313A167)
December 12, 2011	Letter to Christopher Goudreau, North Carolina Wildlife Resources Commission, Division of Inland Fisheries, from William F. Burton, NRC, Request for Comments on the Draft Environmental Impact Statement for the William States Lee III Nuclear Station Units 1 and 2 Combined License Application Review. (Accession No. ML11319A017)
December 13, 2011	Press Release No. 11-220. NRC Seeks Public Input on Draft Environmental Impact Statement for Lee Nuclear Station New Reactors; Meetings Scheduled Jan. 19. (Accession No. ML113470656)
December 15, 2011	Notice of Forthcoming Public Meeting to Discuss the Draft Environmental Impact Statement for the Combined Licenses for the William States Lee III Nuclear Station, Units 1 and 2. (Accession No. ML113400335)

January 20, 2012	Letter from Rebekah Dobrasko, Supervisor of Compliance, Tax Incentives, and Survey, State Historic Preservation Office, to Cindy Bladey, NRC, William States Lee III Nuclear Station Units 1 and 2 Draft Environmental Impact Statement, Cherokee County, South Carolina, SHPO Project No. 06-RD0163. (Accession No. ML12048A671)
February 2, 2012	Letter to Larry Lawrence, Restoration Church International, from Sarah Lopas, NRC, Letter of Appreciation for Use of Restoration Church International for the William States Lee III Nuclear Station Units 1 and 2 Draft Environmental Impact Statement Public Meetings. (Accession No. ML12032A115)
February 2, 2012	Letter to James Taylor, City Administrator, from Sarah Lopas, NRC, Letter of Appreciation for Use of Gaffney City Hall for the William States Lee III Nuclear Station Units 1 and 2 Draft Environmental Impact Statement Government-to-Government Meeting. (Accession No. ML12032A180)
February 8, 2012	Letter to Sheriff Steve Mueller and Major Tim Hartman, Cherokee County Sheriff's Office, from Patrick Madden, NRC, Letter of Appreciation for Protective Services for the William States Lee III Nuclear Station Units 1 and 2 Draft Environmental Impact Statement Public Meetings. (Accession No. ML12032A104)
February 13, 2012	Summary of the Public Meetings for the Draft Environmental Impact Statement to Support Review of the William States Lee III Nuclear Station Units 1 and 2 Combined Licenses Application. (Accession No. ML12032A228)
February 23, 2012	Letter from Jodi Barnes, South Carolina Department of Archives and History, State Historic Preservation Office to Cindy Bladey, NRC, Proposed Transportation Improvements, Lee Nuclear Station, Cherokee County, South Carolina, SHPO Project No. 06RD163. (Accession No. ML12093A006)
February 29, 2012	Letter from Joyce Stanley, Regional Environmental Protection Assistant for Gregory Hogue, Regional Environmental Officer, United States Department of the Interior, Office of the Secretary, Office of Environmental Policy and Compliance, to Cindy Bladey, NRC, Comments on the Combined Licenses for William States Lee III Nuclear Station Units 1 and 2. (Accession No. ML12083A060)

March 1, 2012	Letter from Christopher M. Fallon, Vice President, Nuclear Development, Duke Energy, to Chief, Rulemaking and Directives Branch, NRC, Comments on the Draft Environmental Impact Statement for Combined Licenses (COLs) for William States Lee III Nuclear Station Units 1 and 2, Ltr# WLG2012.03-01. (Accession No. ML12067A037)
March 5, 2012	Letter from Jay B. Herrington, Field Supervisor, Fish and Wildlife Service, to Chief, Rulemaking and Directives Branch, NRC, Comments on the Draft Environmental Impact Statement for Combined Licenses for William States Lee III Nuclear Station Units 1 and 2, ER11/1166, Cherokee County, South Carolina, FWS Log No. 2012-CPA-0041. (Accession No. ML12083A064)
March 6, 2012	Letter from Jay B Herrington, Field Supervisor, U.S. Fish and Wildllife Service, to Lt. Col. Edward P Chamberlayne, U.S. Army Corps of Engineers, Charleston District Commander, FWS Log No. 2012-CPA-0036. (Accession No. ML13317B884)
March 6, 2012	Letter from Virginia M Fay, Assistant Regional Director, Habitat Conservation Division, National Marine Fisheries Service, to Lt. Col. Edward P Chamberlayne, U.S. Army Corps of Engineers, Charleston District Commander. (Accession No. ML13317A347)
March 6, 2012	Letter from Bob Perry, Director Office of Environmental Resources, South Carolina Department of Natural Resources, to Dr. Richard Darden, U.S. Army Corps of Engineers, and Ms. Alicia Rowe, South Carolina Department of Health and Environmental Control. (Accession No. ML12083A059)
March 6, 2012	Letter from Ben Gregg, Executive Director, South Carolina Wildlife Federation, to Nuclear Regulatory Commission, Comments on NUREG-2111, Docket ID NRC-2008-0170. (Accession No. ML12068A364)
March 6, 2012	Letter from Robert D. Perry, Director, Office of Environmental Programs, South Carolina Department of Natural Resources, to Chief, Rulemaking, Directives, and Editing Branch, NRC-2008-0170, Comments on Draft Environmental Impact Statement for Combined Licenses for Units 1 and 2 at the William States Lee III Nuclear Station Site, Cherokee County, South Carolina. (Accession No. ML12083A059)

March 16, 2012	Letter from Heinz J. Mueller, Chief, NEPA Program Office, Office of Policy and Management, U.S. Environmental Protection Agency, Region 4, to Chief, Rulemaking and Directives Branch, EPA Review and Comments, Draft Environmental Impact Statement (DEIS) for the William States Lee III Nuclear Station Units 1 and 2, Combined Licenses (COLs) Application, Constructing and Operating Two New Nuclear Units at the Lee Nuclear Station Site, NUREG-2111, CEQ No. 20110423. (Accession No. ML120790121)
March 29, 2012	Letter from Christopher M. Fallon, Vice President, Nuclear Development, Duke Energy, to NRC, Supplemental Response to Request for Additional Information, Ltr# WLG2012.03-09. (Accession No. ML12093A006)
March 29, 2012	Letter from Christopher M. Fallon, Vice President, Nuclear Development, Duke Energy, to NRC, Supplemental Information to the Environmental Report (Revision 1), Ltr# WLG2012.03-10. (Accession No. ML12093A005)
March 29, 2012	Letter from Christopher M. Fallon, Vice President, Nuclear Development, Duke Energy, to NRC, Supplemental Response to Request for Additional Information, Ltr# WLG2012.03-11. (Accession No. ML12096A077)
March 29, 2012	Letter from Christopher M. Fallon, Vice President, Nuclear Development, Duke Energy, to NRC, Supplemental Response to Request for Additional Information, Ltr# WLG2012.03-12. (Accession No. ML12093A197)
April 10, 2012	Letter from Christopher M. Fallon, Vice President, Nuclear Development, Duke Energy, to NRC, Supplemental Response to Request for Additional Information, Ltr# WLG2012.04-01. (Accession No. ML12143A293)
April 30, 2012	Letter from Christopher M. Fallon, Vice President, Nuclear Development (Acting), Duke Energy, to NRC, Supplemental Response to Request for Additional Information, Ltr# WLG2012.04-05. (Accession No. ML12123A715)

April 30, 2012	Letter from Christopher M. Fallon, Vice President, Nuclear Development, Duke Energy, to NRC, Supplemental Response to Request for Additional Information, Ltr# WLG2012.04-06. (Accession No. ML12123A712)
April 30, 2012	Letter from Christopher M. Fallon, Vice President, Nuclear Development, Duke Energy, to NRC, Supplemental Response to Request for Additional Information, Ltr# WLG2012.04-08. (Accession No. ML12123A714)
May 18, 2012	Summary of William States Lee III Nuclear Station, Units 1 and 2 Section 404 Joint Permit Application Mitigation Sites Visit. (Accession No. ML12132A218)
May 21, 2012	E-mail from Eric Hawk, Southeast Region ESA Section 7 Coordinator, National Marine Fisheries Service, to Sarah Lopas, NRC, Lee Nuclear Station consultation requirements. (Accession No. ML12171A581)
June 13, 2012	Letter from Jay B. Herrington, Field Supervisor, U.S. Fish and Wildlife Service, South East Region, to Sarah Lopas, NRC, Comments on the Draft Environmental Impact Statement for Combined Licenses for William States Lee III Nuclear Station Units 1 and 2, ER 11/1166, Cherokee County, South Carolina, FWS Log No. 2012-CPA-041. (Accession No. ML12221A475**)**
June 21, 2012	Letter from Christopher M. Fallon, Vice President, Nuclear Development, Duke Energy, to NRC, Supplemental Response to Request for Additional Information, Ltr# WLG2012.06-08. (Accession No. ML12178A450)
August 8, 2012	E-mail to Robert Wylie, Duke Energy, from Sarah Lopas, NRC, Ponds A and B Drawdown. (Accession No. ML12280A014)
August 14, 2012	Letter to David Bernhart, Assistant Regional Administrator for Protected Species, National Marine Fisheries Service Southeast Regional Office, from William F. Burton, NRC, Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, and Fish and Wildlife Coordination Act Consultation Close out for the William States Lee III Nuclear Station, Units 1 and 2 Combined Licenses Application Environmental Review. (Accession No. ML12173A383)

September 19, 2012	Letter from Christopher M. Fallon, Vice President, Nuclear Development, Duke Energy, to NRC, Supplemental Information Request, Ltr# WLG2012.09-01. (Accession No. ML12265A066)
October 3, 2012	Letter from Robert Kitchen, Licensing Manager, Nuclear Development, to NRC, 2012 Integrated Resource Plan, Ltr# WLG2012.10-01. (Accession No. ML12279A105)
October 22, 2012	Letter from Richard Darden, USACE, to Wenonah G. Haire, Tribal Historic Preservation Officer, Catawba Indian Nation, Re: Cultural Resources Management Plan and Memorandum of Agreement (MOA). (Accession No. ML13219A882)
November 13, 2012	Email from John Finnegan, Conservation Information Manager, North Carolina Natural Heritage Program, Office of Conservation, Planning and Community Affairs to James M. Becker, PNNL, Re: Lee Nuclear Request of 05-25-11, Transmitting North Carolina Department of Environment and Natural Resources' Updated Summary of North Carolina Species of Concern Records within 15 Miles of the Perkins Site. (Accession Nos. ML13213A439, ML13213A450)
November 20, 2012	Email from Julie Holling, South Carolina Department of Natural Resources, to Jim Becker, Pacific Northwest National Laboratory, Transmitting South Carolina Department of Natural Resources' Updated Summary of South Carolina Species of Concern records within 15 miles of the Lee, Kewoee, and Middleton Site. (Accession Nos. ML13214A349, ML13214A350)
December 3, 2012	Letter from Robert Wylie, Environmental Project Manager, Duke Energy, to Richard Darden, U.S. Army Corps of Engineers, Subject: William States Lee III Nuclear Station, Cherokee County, South Carolina, 404 Application and Jurisdicational Determination. (Accession No. ML13213A412)
December 20, 2012	Letter from Bryan Dolan, Duke Energy, Vice President, Nuclear Development, Duke Energy, to NRC, Supplemental Information Related to Design Changes to the Lee Units 1 and 2 Physical Locations, Ltr# WLG2012.12-02. (Accession No. ML12361A059)

January 10, 2013	E-mail from Richard Darden, USACE, to Robert Wylie, Duke Energy, Rebekah Dobrasko, SCSHPO, Wenonah Haire, Catawba Indian Nation, Patricia Vokoun, NRC, Laura M SAC, Lee Nuclear Station – Cultural Resource Management Plan. (Accession No. ML13213A408)
January 10, 2013	Email from Richard Darden, Regulatory Division, USACE to Patricia Vokoun, NRC, FW: Proposed drawdown of Ponds A and B (UNCLASSIFIED). Forwarding email from Vivianne Vejdani, Environmental Coordinator, Wildlife and Freshwater Fisheries Division, South Carolina Department of Natural Resources. (Accession No. ML13219A947)
January 11, 2013	Letter from Richard L. Darden, Project Manager, USACE, to Robert Wylie, Duke Energy Carolinas, Re: SAC2009-122-SJR. Enclosures – Approved Jurisdictional Determination Forms. (Accession No. ML13221A019, ML13221A024)
March 13, 2013	Letter from Christopher M. Fallon, Vice President, Nuclear Development, Duke Energy to NRC, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station – Docket Nos. 52-018 and 52-019, AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2,Supplemental Information regarding Environmental Review, Ltr#WLG2013.03-01. (Accession No. ML13087A299)
March 22, 2013	Letter from Christopher M. Fallon, Vice President, Nuclear Development, Duke Energy to NRC, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station – Docket Nos. 52-018 and 52-019, AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2, Supplemental Information Regarding Environmental Review, Ltr#WLG2013.03-02. (Accession No. ML13087A201, ML13087A203)
April 3, 2013	Letter from Rebekah Dobrasko, Supervisor of Compliance, Tax Incentives, and Survey, State Historic Preservation Office, to Dr. Richard Darden, USACE, William S. Lee Nuclear Station, Cherokee County, South Carolina, P/N #2009-122-SIR, SHPO Project No. 06-RD0163. (Accession No. ML13220A505)

May 2, 2013	Letter from Christopher M. Fallon, Vice President, Nuclear Development, Duke Energy to NRC, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station – Docket Nos. 52-018 and 52-019, AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2, Supplemental Information's Related to Design Changes to the Lee Units 1 and 2 Physical Locations and Additional Design Enhancements, Ltr#WLG2013.05-02. (Accession Nos. ML13127A224, ML13127A225)
May 9, 2013	Letter from Christopher M. Fallon, Vice President, Nuclear Development, Duke Energy to NRC, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station – Docket Nos. 52-018 and 52-019, Update for William States Lee III Nuclear Station Units 1 and 2 Combined License Applications, Ltr#WLG2013.05-03. (Accession No. ML13144A150)
May 29, 2013	Letter to Christopher M. Fallon, Vice President, Nuclear Development, Duke Energy from Patricia J. Vokoun, Project Manager, NRC, Request for Additional Information Regarding the Environmental Review of the William States Lee III Nuclear Station, Units 1 and 2 Combined License Application. (Accession No. ML13150A311)
July 1, 2013	Letter from Christopher M. Fallon, Vice President, Nuclear Development, Duke Energy to NRC, Duke Energy Carolinas, LLC, William States Lee III Nuclear Station – Docket Nos. 52-018 and 52-019, AP1000 Combined License Application for the William States Lee III Nuclear Station Units 1 and 2, Response to Requests for Additional Information (RAI) 7106, 7118, 7120, 7122 and 7123, Ltr#WLB2013.07-02. (Accession No. ML13192A410)
September 25, 2013	Email from Pete Pattavina, U.S. Fish and Wildlife Services, Georgia Ecological Services Field Offices, to Jim Becker, Pacific Northwest National Laboratory. (Accession No. ML13317B647)

Appendix D

Scoping Comments and Responses

Appendix D

Scoping Comments and Responses

Two scoping processes were conducted for the environmental review of the William States Lee III Nuclear Station Units 1 and 2 (Lee Nuclear Station) combined licenses (COL) application. The initial scoping process was conducted in response to the application COLs for two new nuclear power reactors submitted by Duke Energy Carolinas, LLC (Duke) by letter dated December 12, 2007. The supplemental scoping process was conducted following the submittal by letter dated September 24, 2009, of the supplement to the environmental report describing Duke's plans to construct an additional off-site reservoir (Make-Up Pond C) to provide supplemental cooling water for the proposed Lee Nuclear Station Units 1 and 2.

On March 20, 2008, the U.S. Nuclear Regulatory Commission (NRC) published a Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process in the *Federal Register* (73 FR 15009). The Notice of Intent notified the public of the NRC staff's intent to prepare an environmental impact statement (EIS) and conduct scoping for the application for COLs received from Duke. The NRC invited Duke; Federal, Tribal, State, and local government agencies; local organizations; and the public to participate in the initial scoping process by providing oral comments at the scheduled public meeting and/or submitting written comments no later than May 20, 2008.

On May 24, 2010, the NRC published a Notice of Intent to Conduct a Supplemental Scoping Process for the Supplement to the Environmental Report in the *Federal Register* (75 FR 28822). The Notice of Intent notified the public that the NRC and the U.S. Army Corps of Engineers (USACE) were providing an additional opportunity to participate in the scoping process pertaining to the addition of Make-Up Pond C to the Lee Nuclear Station project scope. Once again, the NRC invited Duke; Federal, Tribal, State, and local government agencies; local organizations; and the public to participate in the supplemental scoping process by providing oral comments at the scheduled public meeting and/or submitting written comments no later than July 2, 2010.

Preparation of the EIS accounted for relevant issues raised during the initial and supplemental scoping processes. The comments received and addressed in NRC's environmental review are included in this appendix. They were extracted from the September 2008 *Environmental Impact Statement Scoping Process Summary Report, William States Lee III Combined License* (ADAMS Accession No. ML082390635) (NRC 2008) and the December 2010 *Environmental Impact Statement Supplemental Scoping Process Regarding Make-Up Pond C Summary Report, William States Lee III Nuclear Station, Units 1 and 2 Combined Licenses* (ADAMS

Accession No. ML103220015) (NRC 2010), and are provided for convenience of those interested specifically in the scoping comments applicable to this environmental review. Comment categories that are outside the scope of the environmental review for the proposed Lee Nuclear Station are not included in this appendix—they are included in their entirety in the scoping process summary reports cited above. These out-of-scope categories include comments related to:

- Safety
- Emergency Preparedness
- NRC Oversight for Operating Plants
- Security and Terrorism
- Support for or Opposition to the Licensing Action, Licensing Process, Nuclear Power, Hearing Process, or the Applicant.

The scoping process provides an opportunity for public participants to identify issues to be addressed in the EIS and highlight public concerns and issues. This appendix provides the comments and the NRC and USACE responses for the two public scoping processes held to support the preparation of this EIS. The Make-Up Pond C supplemental scoping process summary begins on page D-64.

D.1 The Initial Scoping Process

The initial public scoping meeting was held on May 1, 2008, at the Gaffney High School auditorium in Gaffney, South Carolina. The meeting summary and meeting transcript are available electronically in the NRC Public Document Room or from the Publicly Available Records component of NRC's Agency Document Access and Management System (ADAMS), which is accessible from the NRC website at http://www.nrc.gov/reading-rm/adams/web-based.html (the Public Electronic Reading Room; note that the URL is case-sensitive). The ADAMS accession numbers for the meeting summary and the meeting transcript are ML081420057 and ML081400038, respectively.

D.1.1 Overview of the Scoping Processes

At the May 2008 Gaffney meeting, 42 attendees provided oral or written comments that were recorded and transcribed by a certified court reporter. In addition to the oral comments and written statements submitted at the public meetings, the NRC received 18 emails and 8 letters containing comments during the scoping period. At the conclusion of the initial scoping period, the NRC staff reviewed the scoping meeting transcript and all written material received during the comment period and identified individual comments. These comments were organized according to topic within the proposed EIS or according to the general topic, if outside the scope of the EIS. Once comments were grouped according to subject area, the staff determined the appropriate response for the comments.

The comments from the initial scoping period and their responses were published in the *Environmental Impact Statement Scoping Process Summary Report, William States Lee III Combined License, Cherokee County, South Carolina* (ML082390635). To maintain consistency with the Scoping Summary Report, the correspondence identification (ID) number along with the name of the commenter used in that report is retained in this appendix.

Table D-1 identifies in alphabetical order the individuals who provided comments during the initial scoping period, their affiliations, if given, and the ADAMS accession number that can be used to locate the correspondence. Although all commenters are listed, the comments presented in this appendix are limited to those within the scope of the environmental review.

Table D-1. Individuals Providing Comments During the Initial Scoping Comment Period

Commenter	Affiliation (if provided)	Comment Source and ADAMS Accession #
Arnason, Deb	Self	Letter (ML081350290)
		Letter (ML081350296)
		Meeting Transcript (ML081400038)
Barczak, Sara	Southern Alliance for Clean Energy	Meeting Transcript (ML081400038)
		Letter (ML081430235)
Barrett, J. Gresham	State of South Carolina	Letter (ML081350302)
		Letter (ML081420610)
Batchler, James D.	Cherokee County Council	Letter (ML081350311)
Biggs, Diane	Self	Meeting Transcript (ML081400038)
Blackwood, Andy	Self	Meeting Transcript (ML081400038)
Blanton, Debbie	Self	Letter (ML081350307)
Blue, Lilly	Self	Meeting Transcript (ML081400038)
Boger, Paul	Greater York Chamber of Commerce	Meeting Transcript (ML081400038)
Bowers, Will	Self	Meeting Transcript (ML081400038)
Brown, Henry E.	State of South Carolina	Letter (ML081350302)
		Letter (ML081420610)
Chapman, A. Foster	Johnson Development Associates, Inc.	Letter (ML081350300)
Cherin, Mike	Self	Meeting Transcript (ML081400038)
Chisolm, Sarah	Self	Meeting Transcript (ML081400038)

Table D-1. (contd)

Commenter	Affiliation (if provided)	Comment Source and ADAMS Accession #
Clements, Tom	Self	Meeting Transcript (ML081400038)
Clyburn, James E.	State of South Carolina	Letter (ML081350302) Letter (ML081420610)
Connolly, Mary Ellen	Self	Meeting Transcript (ML081400038)
Cook, Jim	Cherokee County Development Board	Letter (ML081350305)
Cordeau, David	Spartanburg Area Chamber of Commerce	Meeting Transcript (ML081400038)
Craig, Anne	Self	Email (ML081400582)
Craig, Thomas	Self	Email (ML081440324)
Crockett, Mary	Broad Scenic River Advisory Council	Letter (ML081490598)
Commenter	Affiliation (if provided)	Comment Source and ADAMS Accession #
DeMint, Jim	South Carolina	Letter (ML081350302) Letter (ML081420610)
Dobrasko, Rebekah	South Carolina Dept. of Archives and History	Email (ML081510453) Email (ML081510939)
Dolan, Bryan	Duke	Letter (ML081350301) Meeting Transcript (ML081400038)
Ebert, Dick	Self	Email (ML081400581)
Forrester, Mike	Spartanburg Community College	Meeting Transcript (ML081400038)
Foster, Rufus H.	Cherokee County Council	Letter (ML081350311)
Gossett, Lewis	Self	Meeting Transcript (ML081400038)
Goudreau, Chris	North Carolina Wildlife Resources Commission	Email (ML081430390)
Graham, Lindsey	State of South Carolina	Letter (ML081350302) Letter (ML081410459)
Guild, Bob	Self	Meeting Transcript (ML081400038)
Hall, Timothy N.	U.S. Fish and Wildlife Service	Letter (ML081540399)
Halligan, Andy	Johnson Development Associates	Letter (ML081350618)
Hamrick, Mike	Self	Letter (ML081420612)
Hardy, Chris	York County Regional Chamber of Commerce	Meeting Transcript (ML081400038)
Hedges, Jean	Self	Email (ML081510940)
Houston, Kate	Clean and Safe Energy Coalition	Letter (ML081400579)

Table D-1. (contd)

Commenter	Affiliation (if provided)	Comment Source and ADAMS Accession #
Humphries, H. Baily	Cherokee County Council	Letter (ML081350311)
Inglis, Bob	State of South Carolina	Letter (ML081350302)
		Letter (ML081420610)
James, Andrew	Self	Meeting Transcript (ML081400038)
Johnson, David G.	Morgan Corp.	Letter (ML081400584)
Jolly, Henry L.	Mayor, Gaffney, South Carolina	Letter (ML081350303)
		Meeting Transcript (ML081400038)
Karpen, Leah R.	Self	Email (ML081420611)
Kohler, Elizabeth	Self	Email (ML081400580)
Little, Quay	Cherokee County Council	Letter (ML081350311)
Mathis, Charles	Cherokee County Council	Letter (ML081350311)
McDowell, Charlie	Congressman John Spratt	Meeting Transcript (ML081400038)
Minerd, Leslie	Self	Meeting Transcript (ML081400038)
Moorhead, Gene	Cherokee County Chamber of Commerce	Meeting Transcript (ML081400038)
Moss, Charles	Self	Meeting Transcript (ML081400038)
Moss, Dennis Carroll	State of South Carolina	Letter (ML081350312)
Murphy, William	Self	Meeting Transcript (ML081400038)
Olson, Mary	Southeast Office of Nuclear Information and Resource Service	Meeting Transcript (ML081400038)
Parris, Hoke	Cherokee County Council	Meeting Transcript (ML081400038)
		Letter (ML081350311)
Patrie, Dr. Lew	Western North Carolina Chapter of Physicians for Social Responsibility	Letter (ML081350304)
		Meeting Transcript (ML081400038)
Peeler, Harvey S.	State of South Carolina	Letter (ML081350309)
Perry, Robert D.	SC Dept of Natural Resources	Letter (ML081430553)
Poole, Mary Jane	Self	Email (ML081350616)
Richardson, Don	Self	Email (ML081510941)
Rudolf, Jerry	Self	Meeting Transcript (ML081400038)
Sandifer, Bill	State of South Carolina	Letter (ML081350308)
Saye, Jack	Self	Meeting Transcript (ML081400038)
Scott, G. Garrett	Johnson Development Associates	Email (ML081350617)
Smith, Karen	Self	Email (ML081440316)

Table D-1. (contd)

Commenter	Affiliation (if provided)	Comment Source and ADAMS Accession #
Smith, Nathan	Self	Meeting Transcript (ML081400038)
Sorensen, Laura	Self	Meeting Transcript (ML081400038)
Spencer, Tim	Cherokee County Council	Letter (ML081350311)
Spratt, John M.	State of South Carolina	Letter (ML081350302)
		Letter (ML081420610)
Sticpewich, John	Self	Meeting Transcript (ML081400038)
Stone, Bryan	Lockhart Power Company	Meeting Transcript (ML081400038)
Sutlock, Dot	Self	Email (ML081510942)
Tansey, Sara	Concerned Future Generations	Meeting Transcript (ML081400038)
Taylor, Joe	South Carolina Department of Commerce	Email (ML0851400583)
Thomas, Amber	Self	Email (ML081430229)
Thronberg, Bob	Self	Meeting Transcript (ML081400038)
Turk, Lawrence "Butch"	Self	Email (ML081510938)
Vogel, Chip	Draexlmaier Automotive of America LLC	Letter (ML081350300)
Waters, Jason	Self	Email (ML081410459)
White, Gayle	Self	Meeting Transcript (ML081400038)
Wilson, Joe	State of South Carolina	Letter (ML081350302)
		Letter (ML081420610)
Wolfe, Clinton	Citizens for Nuclear Technology Awareness	Letter (ML081350306)
		Meeting Transcript (ML081400038)
Woodward, Don	Spartanburg Development Association	Meeting Transcript (ML081400038)
Zeller, Lou	Blue Ridge Environmental Defense League	Meeting Transcript (ML081400038)

D.1.2 In-Scope Comments and Responses

The in-scope comment categories for the initial scoping process are listed in Table D-2 in the order that they are presented in this EIS. The comments and responses for the in-scope categories are included below the table. Parenthetical numbers shown after each comment refer to the comment ID number (correspondence number-comment number) and the commenter name.

Table D-2. Initial Scoping Comment Categories in Order as Presented in this Appendix

D.1.2.1 Comments Concerning the COL Process
D.1.2.2 Comments Concerning Land Use - Site and Vicinity
D.1.2.3 Comments Concerning Land Use - Transmission Lines
D.1.2.4 Comments Concerning Meteorology and Air Quality
D.1.2.5 Comments Concerning Hydrology - Surface Water
D.1.2.6 Comments Concerning Hydrology - Groundwater
D.1.2.7 Comments Concerning Ecology - Terrestrial
D.1.2.8 Comments Concerning Ecology - Aquatic
D.1.2.9 Comments Concerning Socioeconomics
D.1.2.10 Comments Concerning Historic and Cultural Resources
D.1.2.11 Comments Concerning Health - Radiological
D.1.2.12 Comments Concerning Accidents - Severe
D.1.2.13 Comments Concerning the Uranium Fuel Cycle
D.1.2.14 Comments Concerning Transportation
D.1.2.15 Comments Concerning Cumulative Impacts
D.1.2.16 Comments Concerning the Need for Power
D.1.2.17 Comments Concerning Alternatives - Energy
D.1.2.18 Comments Concerning Alternatives – System Design
D.1.2.19 Comments Concerning Alternatives - Sites
D.1.2.20 Comments Concerning Benefit-Cost Balance

D.1.2.1 Comments Concerning the COL Process

Comment: I was trying to understand if this environmental impact statement process is going to be amended as we go through this experiment. And that has to be built into the process. (**0001-128** [Clements, Tom])

Comment: I really don't understand the process. But I'm amazed to find out that it's going to take ten years to get these computers [power plants] on line. I just hope somehow that the environmental impact statement can be changed and monitored over that time. (**0001-153** [Saye, Jack])

Response*: The licensing process for COL applications is specified in 10 CFR 52. The environmental review process associated with new reactor licensing includes a detailed review of an applicant's COL application to determine the environmental effects of building and operating the nuclear power facility for up to 40 years. After review of the application against the regulations and regulatory guidance, a mandatory hearing or optional contested hearing will determine whether it is appropriate for the NRC to grant the license. NRC approval of an application for a COL is not a foregone conclusion. Safety, as well as environmental issues, will be evaluated before a decision on an application is reached.*

Comment: We [Southern Alliance for Clean Energy] would like to comment on the difficulty with reviewing the application. Though we appreciate having the resources available online, it is very cumbersome to do so. (**0001-25** [Barczak, Sara])

Comment: We [Southern Alliance for Clean Energy] would like to comment on the difficulty with reviewing the application. Though we appreciate having the resources available on-line, it is a very cumbersome process to do so. Regular citizens and policymakers do not have the time to wade through these thousands of pages that have to be downloaded at times individually. I would guess that many people in this room have not even looked at one page of the application. And I cannot blame them given the frustration it has caused me. (**0010-5** [Barczak, Sara])

Comment: [The Southern Alliance for Clean Energy] would like to comment on the difficulty with reviewing the application. Though we appreciate having the resources available on-line, it is a very cumbersome process to do so. Regular citizens and policymakers do not have the time to wade through these thousands of pages that have to be downloaded at times individually. We recommend that the NRC require applications to be submitted in a more 'user-friendly' format. (**0049-13** [Barczak, Sara])

Response*: The applicant's Environmental Report is available for public inspection at the NRC Public Document Room in Rockville, Maryland, and at the Cherokee County Public Library in Gaffney, South Carolina. The Environmental Report is also available electronically through the NRC's Agencywide Documents Access and Management System website at* http://www.nrc.gov/reading-rm/adams.html *and at http://www.nrc.gov/reactors/new-licensing/col/lee.html. The Public Document Room can also be contacted at http://www.nrc.gov/reading-rm/pdr/copy-service.html to request a paper copy or CD/DVD of the document for a fee. These comments do not provide information on the impacts of construction or operation of the proposed units on the environment and will not be addressed further in the EIS.*

Comment: I know that it's very difficult -- first of all, I have to say this -- the timing for people like myself who will be impacted by so many new proposed nuclear expansions and projects being rushed into existence all over the country, and especially here in the south. (**0001-64** [Arnason, Deb])

Comment: I find your timing very difficult for folks like myself who will be impacted by so many new proposed nuclear expansions and projects being rushed into existence all over the country and especially here in the South. (**0007-1** [Arnason, Deb])

***Response**: Each applicant determines when to submit its COL application for a proposed project to the NRC. After the NRC accepts the application, it initiates the environmental review process in accordance with 10 CFR Part 51. These comments do not provide information on the scope of the environmental review for the proposed units and will not be addressed further in the EIS.*

Comment: [A]dd it up -- we are in seven combined operating license proceedings in this region. There is no other part of the United States that is having combined operating license applications for new nuclear power reactors. There are rumors that they may come in. So there's a lot going on and that lot that's going on has to be viewed as a phenomenon under NEPA. And I see it being chopped into a bunch of little pieces and I see federal money being spent and I see claims being made that are vast issues, like climate change, being addressed. (**0001-56** [Olson, Mary])

***Response**: This comment expresses concern regarding the cumulative impacts of seven COL proceedings occurring at the same time but provides no specific information on the scope of the environmental review of the Lee COL application. Therefore, this comment will not be addressed further in the EIS.*

D.1.2.2 Comments Concerning Land Use - Site and Vicinity

Comment: 2.4.2.5.9 Recreation Areas. DNR appreciates acknowledgement of the Broad Scenic River Corridor as an outstanding natural resource and recommends Duke utilize the Broad Scenic River Management Plan (2003) as a resource in planning project operations. (**0046-17** [Perry, Robert D.])

Response: *Duke is a participant in and voting member of the Broad River Scenic Advisory Council. The Broad River is officially recognized by the South Carolina General Assembly as a State Scenic River (1991) that relies on river-bordering landowners, other local citizens, and the State Department of Natural Resources (DNR) working to conserve the river and its valuable resources consistent with the Council's mission. The NRC staff will evaluate resources such as the Broad River in Chapters 4 and 5 of the EIS.*

D.1.2.3 Comments Concerning Land Use - Transmission Lines

Comment: All activities associated with the construction and necessary operations of the Lee site should be considered a part of the project and considered in the EIS. Construction of transmission lines, roads and support structures may contribute to resource impacts that extend well beyond the foot print of the Lee site. Stormwater detention and retention capacities should be designed and constructed to adequately prevent contamination of adjacent land and water, particularly the Broad River. (**0045-10** [Hall, Timothy N.])

Comment: 2.2.2 Transmission Corridors and Onsite Areas, page 2.2-5. The ER states 2 transmission rights-of-way are proposed for the plant. On Dec 31, 2007 Duke advised DNR by letter and a 1-page 8.5 X 11.0 map, at scale of 1 in = 2 mi the approximate location of the 2 transmission corridors measuring (widths respectively) 200 ft (525 kV) and 150 ft (230 kV) and 325 ft (concurrent 525 and 230 kV). As of this date, DNR has not been provided with finalized routes and projected wetland impacts or impact acreages for proposed transmission corridor routes. Wetland impacts including clearing and fill proposed in transmission corridors will be subject to permitting requirements under Sections 401 and 404 of the US Clean Water Act. The SC Navigational Waters Act also requires permitting of overhead transmission corridors if waters defined by this legislation are crossed. (**0046-2** [Perry, Robert D.])

Response: *Environmental impacts associated with any planned new transmission rights-of-way will be addressed in the context of cumulative effects, as well as potential impacts associated with upgrades to the existing lines if required. The NRC does not have any regulatory authority regarding the implementation of Federal, State, and local guidelines in construction practices. The EIS will address any known or proposed activities that could impact the site or transmission corridor environmental conditions and proposed mitigation measures, as appropriate.*

Comment: In 1991, the South Carolina General Assembly passed legislation that recognized I believe it's a 15.3 mile stretch of the Broad River from Ninety-Nine Island, where this plant is at, all the way down to the peck (ph.) of the river. Duke was involved with this. The map that Duke sent me at the house, it shows that the transmission lines are going to follow the river almost per capita (sic). So I'd like to ask Duke Power, you were part of the Scenic Broad River Act, what's scenic about having an unGodly looking power line following the river? (**0001-105** [Moss, Charles])

Comment: Most importantly to a scenic river [forested uplands] are the reason it was declared scenic. If the upland forests are removed to provide area for transmission line corridors and structures the scenic viewshed could be affected. In order to improve and minimize impacts to this scenic viewshed, we recommend placing the transmission line structures and corridor away from the river where the natural ecosystem and viewshed disturbance will be less of an impact to the river. (**0042-7** [Crockett, Mary])

Response: *Duke is a participant in and voting member of the Broad River Scenic Advisory Council. Part of the Council's mission is to "…educate, protect, conserve, and be an advocate for the well being of the river through open communication with interested partners…[and to] work to develop responsible, limited and managed access to the resource and to maintain open lines of communication with other interested groups." Environmental impacts associated with any planned new transmission rights-of-way will be addressed in the context of cumulative effects.*

Comment: I am a resident of Cherokee County and this power line deal, my property is going to be impacted, this line is going to cross my property...we've had plans to build us a house and these folks have already been in there surveying and the survey team came right through where our living room was going to be. I don't think this is fair for Duke to be able to do this. (**0001-120** [Blackwood, Andy])

Response: *Environmental impacts associated with any planned new transmission lines and rights-of-way will be addressed in the context of cumulative effects. The NRC does not have any regulatory authority regarding the implementation of Federal, State, and local guidelines in the siting, construction, and maintenance of proposed transmission corridors and lines.*

D.1.2.4 Comments Concerning Meteorology and Air Quality

Comment: If in fact the federal money is being spent in the cause of trying to reverse the climate crisis; if in fact the federal spending for new nuclear power is to address climate, then it is incumbent upon NRC to assess the ability of nuclear power to do that job. We must evaluate whether nuclear energy can in fact impact and reverse the climate crisis. Is it the most cost-effective way to go? (**0001-54** [Olson, Mary])

Comment: When we think of how much we have changed our view of the climate and the environment in the last ten years and what comes with global warming and all the other aspects that have changed so much, hopefully the environmental impact statement will cover all those things. (**0001-154** [Saye, Jack])

Comment: Do we have proof that nuclear energy contributes significantly to reducing gas emissions? As yet the impact of climate change on nuclear operations is unclear. (**0034-7** [Karpen, Leah R.])

Response: *The NRC staff will evaluate the COL application based on the criteria described in NUREG-1555 (NRC 2000). In addition, the NRC staff will evaluate the proposed units' various gaseous emissions from both construction and operation, as well as emissions for a new coal- or natural gas-fired power plant constructed in the same location. The results of these analyses will be presented in Chapters 4, 5, and 9 of the EIS, respectively.*

Comment: I think that when evaluating the impacts of the expansion -- or the new reactors at the Lee site, that one part of the discussion really has to be whether or not nuclear energy is the response to climate change that everyone thinks it is. While I understand that it is emission free in its energy production, it is not at all emission free in its life cycle. When we're looking at environmental impacts of new nuclear reactors, we have to look beyond our community to the impacts on the state, on the country and on the world. (**0001-118** [Tansey, Sara])

Comment: I was a little bit shocked to see in the Duke fact sheet, and I also heard a couple of people say this, that nuclear power does not emit greenhouse gases. One of the previous speakers pointed out that you have to look at the entire nuclear fuel cycle. This is simply not true. The mining of uranium, which takes place in the United States on a lot of native lands, the milling, the enrichment of uranium at enrichment plants uses a huge amount of energy. Then you have to count the construction costs, managing the nuclear waste, taking apart the plant in the future and dealing with the waste far, far into the future. (**0001-132** [Clements, Tom])

Comment: [N]uclear fuel production causes air pollution. (**0001-140** [Patrie, Dr. Lew])

Comment: Despite nuclear industry's assertions that nuclear energy is clean, nuclear fuel production causes air pollution. (**0015-3** [Patrie, Dr. Lew])

Comment: Where's the proof that nuclear energy can contribute significantly to reducing greenhouse gas emissions - particularly in the immediate, most critical period of time, and when accounting for all life cycle emissions? (**0038-8** [Turk, Lawrence "Butch"])

Comment: The EIS should consider the potential environmental impacts associated with production of raw materials for the new nuclear site, as well as any related improvements in infrastructure necessary to bring those raw materials into the Lee site or to transport hazardous wastes from the site. Please consider the entire supply chain, transportation, use, and disposal in your analysis of these air quality effects. (**0045-1** [Hall, Timothy N.])

Response: *The NRC staff will evaluate impacts from the life-cycle of fuel production, construction, operation, and decommissioning of the plant. The results of this analysis will be presented in Chapters 4, 5, and 6 of the EIS. The generic impacts of the fuel cycle are codified in 10 CFR 51.51(b), Table S-3, "Table of Uranium Fuel Cycle Environmental Data." Per the guidance in 10 CFR 51.51, the staff will rely on Tale S-3 as a basis for the impacts of uranium fuel-cycle impacts (including fossil emissions) to include uranium mining and milling.*

Comment: I'm just wondering how you model the effects of 35 million gallons of water a day or more going to water vapor so close to the mountains. What effect is that going to have? How is that modeled? (**0001-155** [Saye, Jack])

Response: *The NRC staff will evaluate the effects of the cooling tower plumes associated with the new units following the guidance described in NUREG-1555. The standard computer model used in this analysis is the Seasonal-Annual Cooling Tower Impact Prediction Code, which is explicitly designed to represent cooling tower plumes. Analysis results will be presented in Chapter 5 of the EIS.*

Comment: Concerns about air and restrictions of sulfur dioxide, nitrous oxide and mercury are what we hear about. Nuclear can generate 24/7 with no greenhouse gas emissions. (**0001-76** [Blue, Lilly])

Comment: [S]ome claim that nuclear power cannot tangibly affect climate change and will cause staggering emissions. The fact is that each plant offsets the emission of tens of millions of tons of carbon dioxide annually. (**0001-83** [James, Andrew])

Comment: We are looking at more stringent federal ozone requirements in this region and we need to generate more power, but we have to do it in an age where reducing greenhouse gas is a national priority. For this region, nuclear power is the best method to generate energy and to help us meet those federal air quality standards at the same time. (**0001-95** [Gossett, Lewis])

Comment: At the same time, nuclear energy has a small carbon footprint and contributes to the United States quest to reduce carbon emissions and other air pollutants (**0016-2** [Cook, Jim])

Comment: At the same time, nuclear energy has a small carbon footprint and contributes to the United States quest to reduce carbon emissions and other air pollutants. (**0047-2** [Vogel, Chip])

Response: *The NRC staff will evaluate the proposed units' gaseous emissions. The results of this analysis will be presented in Chapter 5 of the EIS. The NRC staff will evaluate emissions associated with the construction of either a coal- or natural gas-fired power plant. The results of this analysis will be presented in Chapter 9.*

D.1.2.5 Comments Concerning Hydrology - Surface Water

Comment: Duke and the NRC should know that we are currently suffering from drought. Yet Duke's application references the 2005 South Carolina water use report summary that says the last multi-year drought was in 1998. Well, guess again, we're in a severe one now and Duke should have mentioned that in the application. The NRC certainly must address this as it prepares the draft EIS. According to Duke's application, and the NRC will have calculations to figure this out, the two Lee reactors will withdraw, during normal use, over 47 million gallons of water per day from the Broad River and will consume or lose an average of 35 million gallons per day, returning only one-quarter back to the river. The maximum withdrawal will be over 81 million gallons per day with maximum consumption of over 41 million gallons per day. So overall, the loss will be approximately 50 to 75 percent. That is unacceptable. (**0001-18** [Barczak, Sara])

Comment: The application also mentions that average surface water use -- and this is for both public and industrial -- in Cherokee County was 8.4 million gallons per day. This means that on a daily basis, the Lee plant will use six to ten times the amount of surface water used by everyone else in the county combined -- six to ten times the amount. (**0001-19** [Barczak, Sara])

Comment: The plant will be competing [for water] with other important uses in South Carolina and the region, and the application does not acknowledge the impacts this may have, nor does it discuss the impacts this could have during severe drought conditions such as we are currently experiencing. That has to be considered in the draft EIS. (**0001-20** [Barczak, Sara])

Comment: The Broad River is already stressed from the drought and from a variety of industrial and municipal users. Duke also has efforts to expand the Cliffside plant in North Carolina, which also aims to take huge amounts of water from the Broad River. The full extent of these proposed impacts are not discussed in the application. The NRC needs to analyze not only the Broad River of today but the Broad River of tomorrow, which is slated for more development. The application even states that an estimated 56 percent increase in water demand is projected from 1997 to 2020 for the North Carolina portion of the Broad River basin alone. How will the Broad River be able to provide enough water for all these needs? (**0001-21** [Barczak, Sara])

Comment: Duke's nuclear power plants, if constructed on the Broad River, would use many more times the water supply than all of Cherokee County's homeowners, municipal water suppliers and industrial users on this river. (**0001-28** [Zeller, Lou])

Comment: We will also be looking at water impacts. We're teaming up with a number of groups working on coal, working on water, and we will be definitely examining what kind of a realistic basis you are addressing in terms of communities having to negotiate and sign deals and political brokering over having drinking water -- drinking water in the southeast recently. What is the impact of adding two more generating units that require such vast amounts of water. (**0001-52** [Olson, Mary])

Comment: I do understand that there are drought problems through Alabama, Georgia, North Carolina, South Carolina, Florida and I know that Duke has had problems this past year. The drought shut down -- Duke had problems when water levels dropped on Lake Norman. There's another article here drought may shut down nuclear reactors. (**0001-65** [Arnason, Deb])

Comment: The concern I mentioned is that we do have a hydro-electric plant downstream of the proposed site on the Broad River. A lot of water is going to flow out of the Broad River for cooling. From the brief amount that I read, the idea is that it will be used for cooling and then it in turn -- but that heats the water up -- in turn it will be cooled back down so that it's put back into the river at the temperature that approximates what it's taken out at, to minimize that impact on the river and the ecology. I understand also is that there will be some amount of evaporative losses associated with that. There'll be water that will permanently be lost from the Broad River. As a hydro-generation owner that's downstream of this plant, obviously that's an impact. The more water that's removed and also lost from the river, the less that we will be able to generate in hydro-generation. We're not the only hydro-generator downstream of this proposed site. There are a number of hydro-generators downstream that could include some of Duke's as a matter o fact. So I'm sure they're aware of that proposed problem. The question is, you know, what's a fair balance between having this water that's lost to generate nuclear energy and the loss to those that need to generate renewable hydro-generation, hydroenergy. (**0001-100** [Stone, Bryan])

Comment: There's not going to be enough water in the Broad River to cool the reactor. They're going to have to build a lake, a major lake. They ain't going to cool that thing down, it's going to blow up and kill everybody in 50 miles. (**0001-122** [Blackwood, Andy])

Comment: When I look at the environmental documents that are posted on the NRC website, I noticed that a certain low flow of the river was chosen and that Duke, even using their figure, that 16 percent of the river was going to be used, not just withdrawn, but actually used. And I know that the NRC has been reluctant to analyze the impact during severe drought situations, which is what we're in now. (**0001-129** [Clements, Tom])

Comment: [T]he Cliffside coal plant upstream, and downstream there are two more reactors that South Carolina Electric & Gas has said that they're looking at also on the Broad River. So this environmental impact statement has to look at the cumulative impacts of the river -- on the river. (**0001-131** [Clements, Tom])

Comment: I ask the Nuclear Regulatory Commission to examine the effects of drought and decreased water on the state of South Carolina. (**0001-163** [Smith, Nathan])

Comment: I also request that they investigate the impacts of climate change on this proposed plan and how the possible increase in water temperature will affect it. (**0001-164** [Smith, Nathan])

Comment: Cooling towers use massive amounts of water in addition to the water demand of the plant itself. (**0001-190** [Connolly, Mary Ellen])

Comment: With drought conditions getting worse each summer, we may very well need to go to the Broad for a water source. Last -- just before the last rain started, you could almost walk across the Broad River as well as the Catawba River. We are the fastest growing county in the state and the second or third fastest growing in the nation. We cannot afford another massive water user such as a nuclear power plant. This is a beautiful scenic river and has been an historical asset to our county. (**0001-194** [Connolly, Mary Ellen])

Comment: At the nuclear power plant itself, I am concerned about the huge amount of water needed in the energy production and its possible/probably contamination. (**0005-2** [Craig, Anne])

Comment: With the drought conditions that so severely impacted these States this past year, I find this [proposal to build a new nuclear reactor in Gaffney, SC] unbelievable. I'm sure you are aware that nuclear energy is such a water guzzler, worse than the population, because it evaporates the water instead of returning it to the ground. With water wars already in place in GA, AL, LA, NC, SC and FL, how could Duke even contemplate such a move or the NRC take it seriously? (**0007-2** [Arnason, Deb])

Comment: Where will the water come from to cool this proposed new reactor? (**0007-3** [Arnason, Deb])

Comment: Duke and the NRC should already know that we are currently suffering from a historic drought. Yet Duke's application references the 2005 South Carolina Water Use Report Summary that says the last multi-year drought was in 1998. Well, guess again. We're in a severe one now and Duke should have mentioned that in the application and the NRC certainly must consider this as it prepares the draft EIS. According to Duke's application, the two Lee reactors will withdraw during normal use over 47 million gallons of water per day (mgd) from the Broad River and consume, or lose, on average over 35 mgd, returning only one quarter back to the river. The maximum withdrawals will be over 81 mgd with maximum consumption of over 41 mgd. So overall consumptive loss will be approximately 50-75%. That is unacceptable. (**0009-8, 0049-7** [Barczak, Sara])

Comment: The application also mentions that average surface water use (public and industrial) in Cherokee County was 8.4 million gallons per day. This means that on a daily basis the Lee plant could use six to ten times the amount of surface water used by everyone else in the county combined. The plant will be competing with other important water users in South Carolina and the region. Yet, the application does not acknowledge the impacts this may have,

nor does it ponder the impacts this could have during severe drought conditions, such as we are currently experiencing. The NRC needs to address this in the draft EIS.
(**0009-9, 0049-8** [Barczak, Sara])

Comment: The Broad River, from which the Lee site will rely, is already stressed from the drought and a variety of industrial and municipal users. Further, other proposals, such as Duke's efforts to expand the Cliffside coal plant in NC, also aim to use huge amounts of water from the Broad River. The full extent of these proposed impacts are not discussed in the application. The NRC needs to analyze not only the Broad River of today but the Broad River of tomorrow, which is slated for more development. The application even states that an estimated 56 percent increase in water demand is projected from 1997 to 2020 for the North Carolina portion of the Broad River basin. How will the Broad River be able to provide enough water for all these needs? (**0010-1, 0049-9** [Barczak, Sara])

Comment: Nuclear power plants require tremendous amounts of water for their operation. Specifically, how much water will be used, how much returned to the source, how much will escape as steam? What will be the source of water, and how much? Have climate changes been considered? (**0034-3** [Karpen, Leah R.])

Comment: Duke's nukes would consume 4 times as much water as all public and industrial users in Cherokee County combined (Duke License Application Environmental Report Section 2.3.2). This water usage would put all residents at risk because this is Cherokee County's only water source. (**0035-4** [Hamrick, Mike])

Comment: The recent droughts have increased the public's awareness of the limited availability of water in the Broad River basin. A number of municipalities are investigating the potential to increase their water withdrawals or to construct new storage reservoirs or intake facilities. This trend is likely to continue over the term of the proposed nuclear facility as human demand for water increases with increased population size. We want to be assured that the hydrology of streams in North Carolina will not be altered in order to provide cooling water for the nuclear project. This could occur in several ways. Water could be diverted directly from the Broad River basin or another basin in North Carolina. Another possibility is that water stored in existing or future reservoirs could be allocated to meet the cooling water needs for the Lee facility. In either event, it is likely that the flow regime in North Carolina streams and rivers would be altered in terms of magnitude, duration, timing, frequency or rate of change. The EIS should assess whether the nuclear project is able to operate throughout the projected license term without altering the hydrology of North Carolina streams. Any existing or potential interbasin transfer infrastructure and facilities should be included and discussed in detail in the EIS. (**0037-4** [Goudreau, Chris])

Comment: A nuke requires millions of gallons of water - in some cases per day, in some cases per minute. Where will the water come from? How much will be returned to that source and how much will leave the site as steam? How will that water sacrifice impact our environment, agriculture, and local water supplies including drinking water? Are climate change projections factored in? (**0038-3** [Turk, Lawrence "Butch"])

Comment: What water will cool these reactors? Who else needs that water? What if the long drought predicted comes true? (**0041-1** [Sutlock, Dot])

Comment: We are also concerned about the amount of water needed to run and shutdown the proposed facility and would want to read about a water supply study and plan for low water periods. (**0042-6** [Crockett, Mary])

Comment: 2.4.1.1 Existing Cover Types, page 2.4-3. The ER states that Make-up Pond B was created by damming McKown's Creek, a perennial stream. Likewise, Hold-up Pond A was created by damming a small stream and backwater of the Broad River and Make-up Pond A by damming a backwater of the river. These impacts also should be included in the discussion of environmental impacts contained within Chapters 4 and 10. (**0046-8** [Perry, Robert D.])

Comment: 2.4.2.6. Waters of the United States. The ER identifies the section of the Broad River upstream of the Ninety-Nine Islands dam as not being an interstate navigable water (Section 10 US Navigable Water). However, it is a State navigable water, subject to permitting requirements pursuant to South Carolina R.19-450 under the State Navigable Waters Act.

The ER references Fig. 2.4-1 as a map of jurisdictional waters of the US and refers to 8 onsite stream channels as jurisdictional waters of the US, but these areas are not identified in Fig. 2.4-1. It also is not clear whether onsite impoundments are jurisdictional waters of the US. Duke should submit for review a map with all waters of the US clearly identified. (**0046-18** [Perry, Robert D.])

Comment: 4.1.1.2 The Vicinity, page 4.1-3. Potential impacts are considered only for National Scenic Rivers, of which there are none within the vicinity of the project. DNR submits impacts be considered not only for National Wild and Scenic Rivers, but also for the state-designated Broad Scenic River immediately downstream of the site. (**0046-20** [Perry, Robert D.])

Comment: 5.3.1.1.3. Operations During Low Flow Conditions, page 5.3-3. The Broad River basin upstream of the Gaffney gauge incurs low to moderate regulation due to upstream hydropower operations. These hydropower projects are run-of-the-river projects at normal to high flows, but impacts from these facilities are very noticeable during low instream flow periods. Though the methodology employed by Duke is sometimes used by the United States Geological Survey (USGS) in computing 7Q10 values, the usefulness of this value is questionable due to the existing stream regulation throughout much of the upper Broad River basin, and it is not a value occurring under natural conditions. DNR hydrologists generally discourage using 7Q10 values for instream minimum flows and oppose the 479 cfs value computed by Duke because of impacts of stream regulation on low flows.

There are 2 published 7Q10 values on the Broad River at the Gaffney gauge, both of which only use measured data at the site. Steinert (1989) in the SCWRC Report No. 166 indicated a value 562 cfs, while a 1991 USGS Water Resources Investigations Report (91-4170) demonstrated a value of 540 cfs. Neither of these reports includes data from the 1998-2002 droughts, which may lower the 7Q10 value.

DNR hydrologists have computed synthetic hydrographs for the Broad River at the Gaffney gauge using alternative methods disregarding the Blacksburg gauge. This was done to show the impacts of using the Blacksburg gauge (downstream from the Gaston Shoals Hydroelectric Development). First, the area proration method was used for all the data gaps at the Gaffney gauge based solely on the Boiling Springs, NC gauge including the 1997-2006 period. A second hydrograph was developed using a correlation between the Boiling Springs gauge and the Gaffney gauge (R^2 = 0.90). These hydrographs produced 7Q10 values in the range of 530-540 cfs, over 50 cfs higher than the value computed by Duke. These computations were calculated to show use of the Blacksburg data tends to lower the 7Q10 value from what may occur naturally due to the impacts of regulation at the Gaston Shoals Hydroelectric Development during low flow periods.

Minimum flows in the Broad River at the Ninety-Nine Islands reservoir are regulated by Federal Energy Regulatory Commission (FERC) license: 966 cfs January through April; 725 cfs May, June, and December; and 483 cfs July through November. However, there are several places in the ER where the 7Q10 value is quoted when discussing water availability during low flow conditions (see section 3.3.1.1 for example). If minimum flows are indeed designated by the existing FERC license then references to the 7Q10 value should be avoided when discussing water availability during low flow conditions.

In section 5.3.1.1.3 an analysis was done to determine when and how long the proposed nuclear plant would have had to shut down due to water shortages based on the 1926-2006 historic hydrograph. The threshold flow under which water would start to be withdrawn from Make-Up Pond B was 538 cfs (483 cfs +55 cfs). The 483 cfs value, the minimum FERC flow for July through November, was used for all 12 months. The same analysis should be repeated using seasonally based minimum flows stipulated from the FERC license. Though water shortages are most likely to occur during the dry season (July through November), designated seasonal minimum flows may serve to prolong water shortage periods and potentially increase the frequency of water shortages. A DNR analysis has been done to reconstruct the same synthetic hydrograph Duke computed using the area proration method. The 42 consecutive days of curtailed operation during 2002 listed in section 5.3.1.1.2 of the ER would be increased to 61 days when considering the seasonally based flows as required by the FERC license.

DNR hydrologists also repeated this analysis using the synthetic hydrograph based on the regression relationship developed between the Gaffney gauge and the Boiling Springs gauge. The analysis also subtracted current net withdrawal from the river between the 2 gauges as determined from the Broad River Water Supply Study (approximately 27 cfs). This analysis improves water availability outlook under the minimum flow requirements from the FERC license by reducing the number of days the plant would have to shut down during 2002 to 25 days. These results also show minimum flows stipulated by the FERC license will have limited impacts on plant operations. However, DNR emphasizes the need to increase Lee Site off-stream water reserves to further ensure future operations and electric generation be uninterrupted due to limited but needed water availability**.**

Duke, as documented in the Broad River Water Supply Study and section 2.3.1.3.3 of the ER, is planning an expansion of their Cliffside Electric Generation Station. Duke currently withdraws 6.72 MGD (10.4 cfs) from the Broad River at Cliffside, and by 2015, the withdrawal is expected to be 20.68 MGD (32.1 cfs), giving a net increase of 14 MGD (23 cfs) in the total withdrawal. In addition, the North Carolina water demand is projected to increase by 23 cfs by 2020 (section 2.3.2.1.4) in the Broad River basin. The low flow analyses in section 5.3.1.1.3 based on the historic hydrograph do not appear to take into account these projected increases in water withdrawals (or any other projected withdrawals as described in the Broad River Water Supply Study). DNR encourages a more complete analysis of water availability issues and water shortages during low flow conditions, taking into account future water withdrawal projections. Given the frequency and severity of droughts over the past 10 years and the projections of future water demand in the Upper Broad River basin, DNR is concerned with potential water shortages and plant shutdowns. How dependent will this region become on this plant and how could the loss of a substantial amount of power for weeks to months at a time affect this region now and in the future? Will the plant become so vital to future power needs that future minimum flow requirements will be compromised? DNR recommends developing additional backup water reserves in addition to Make-Up Pond B to lessen the potential for plant shutdowns and to avoid water availability conflicts in the future. Back up water reserves should be sufficient to cover the longest consecutive projected plant shutdown based on the historic hydrograph record. DNR recommends the proposed Lee Site plant operations be consistent with the guidance and policies described within the SC State Water Plan, 2nd Edition which can be viewed at http://www.dnr.sc.gov/water/admin/pubs/pdfs/SCWaterPlan2.pdf. (**0046-26** [Perry, Robert D.])

Response: *The construction and operation of a nuclear plant involves the consumption of water. The staff will independently assess the impact of these consumptive water losses on the sustainability of both the local and regional water resources. This assessment will consider both current and future conditions, including changes in water demands to serve the needs of the future population, and changes in water supply. While the NRC does not regulate or manage water resources, it does have the responsibility under NEPA to assess and disclose the impacts* *of the proposed action on water resources. The staff's assessment of the impacts on the sustainability of water resources will be presented in Chapters 4 and 5 of the EIS for construction and operation, respectively. In addition, staff will evaluate system design alternatives, including cooling water systems, and mitigation measures in Chapter 9.*

Comment: In terms of water, nuclear power plants have a large impact on water quantity and quality, they release radioactive contaminants and hazardous chemicals into our water resources, they contribute to thermal pollution, they negatively impact aquatic life and they definitely require more water than other forms of energy and significantly more water than energy efficiency and clean energy technologies such as solar and wind. This is not mentioned in the application. (**0001-17** [Barczak, Sara])

Comment: [N]uclear plants cause thermal water pollution (**0001-139** [Patrie, Dr. Lew])

Comment: Nuclear power plants have a large impact on water quantity and quality. Nuclear power plants release radioactive contaminants and hazardous chemicals into surrounding water resources, contribute greatly to thermal pollution, negatively impact aquatic life, and require enormous volumes of water in order to operate-requiring more water use than other traditional forms of energy production and significantly more water than energy efficiency measures and clean energy technologies such as solar and wind. (**0009-7, 0049-6** [Barczak, Sara])

Comment: Despite nuclear industry's assertions that nuclear energy is clean, nuclear plants cause thermal water pollution. (**0015-2** [Patrie, Dr. Lew])

Comment: We would also like to recommend that all the storm water and runoff from any development or construction be collected and filtered/treated before it is allowed to enter the riparian areas of the Broad River or the Broad Scenic River. (**0042-3** [Crockett, Mary])

Response: *The construction and operation of a nuclear plant involves some discharges to nearby water bodies. The Clean Water Act designated the U.S. Environmental Protection Agency as the Federal agency with responsibility over effluent discharges to the nation's waters. While it only regulates radiological effluents, the NRC does have the responsibility under NEPA to assess and disclose the expected impacts of the proposed action on water quality throughout the plant's life. The staff's assessment will consider whether the designated uses of the local and regional water supplies are jeopardized by the construction or operation of a nuclear plant at the proposed site. The staff's assessment of the nonradiological impacts to water quality will be presented in Chapters 4 and 5 of the EIS for construction and operation, respectively, while radiological impacts during operation will be presented in Chapter 5. Any cumulative effects will be address in the cumulative effects section of the EIS.*

Comment: 5.2.3.1 Thermal Impacts, page 5.2-10. DNR requests the CORMIX model and associated data used to evaluate thermal impacts associated with blowdown discharge from the cooling towers be provided to staff for review. (**0046-24** [Perry, Robert D.])

Response: *The NRC has requested input data for the CORMIX model from the applicant and will run the model as a part of its analysis of thermal impacts.*

D.1.2.6 Comments Concerning Hydrology - Groundwater

Comment: 2.3.1.5.4 Topography, page 2.3-16 Paragraph 3 indicates numerous springs (20) and seeps were identified during the 1973 investigation. These springs and seeps were cut or filled in order to level natural drainage and flatten the construction yard during the initial construction phase of the Cherokee facility. However, the ER does not include these impacts in the description of Environmental Impacts of Construction in Chapter 4. Impacts associated with the original construction that occurred in the 1970s supporting active operations of the proposed facility should be included in the description of environmental impacts in Chapter 4. (**0046-3** [Perry, Robert D.])

Response: *Staff will evaluate and disclose the impacts of Duke's current construction activities in Chapter 4 of the EIS. Impacts from construction of the Cherokee facility in the 1970s will be addressed in the cumulative effects section of the EIS.*

D.1.2.7 Comments Concerning Ecology - Terrestrial

Comment: I would encourage the environmental impact statement to look at what wildlife in Cherokee County can benefit from the conservation program and open land provided by the nuclear power plant. (**0001-125** [Chisolm, Sarah])

Response: *Wildlife on the Lee site, as well as any benefits derived from the open land onsite and conservation programs in which Duke Power participates, will be described in Chapter 2 of the EIS.*

Comment: The proposed project may include destroying vegetation near the river and surrounding areas in order to place transmission line corridors and buildings associated with the construction of a nuclear power station. (**0042-1** [Crockett, Mary])

Comment: Forested uplands draining into the river floodplain and riparian areas perform numerous wildlife habitats, hydrologic, and water quality functions that provide significant and well-documented public benefits. Additionally, floodplains and riparian areas can help to alleviate downstream flooding. Most importantly to a scenic river they are the reason it was declared scenic. (**0042-2** [Crockett, Mary])

***Response:** Upland forests, floodplains, riparian areas, and wetlands and their function will be described in Chapter 2 of the EIS. The potential impacts of construction to these systems on the Lee site and along new transmission rights-of-way will be described and evaluated in Chapter 4 of the EIS or as a cumulative effect as appropriate. The scenic river status of the Broad River will also be addressed in these chapters.*

Comment: The EIS should present a detailed analysis of potential impacts to federally protected species as a result of the construction and operation of the Lee site. Although the main facility may be located in Cherokee County, infrastructure development, mining operations and supply components are an integral part of the reactor facility and must be review for impacts to threatened and endangered species. (**0045-5** [Hall, Timothy N.])

***Response:** Federally and State-ranked species within the areas affected by this project will be described in Chapter 2 of the EIS. The potential impacts of construction and operation on Federal and State-listed species on the proposed Lee site will be described and evaluated in Chapters 4 and 5 of the EIS. However, impacts of activities at unspecified locations, such as mining operations, are not within the scope of this review and will not be addressed in this EIS.*

Comment: The [U.S. Fish and Wildlife] Service does have records of smooth coneflower (*Echinacea laevigata*) from near the Cherokee County project site. We recommend a field survey to determine the presence or absence of this species and its habitat. The listed T&E species include Federal species of concern that are currently under status review by the Service and may occur in the project impact area. Federal species of concern are not legally protected under the Act and are not subject to any of its provisions, including Section 7, unless they are formally proposed or listed as endangered or threatened. We are including these species in our response to give you advance notification and to request that any surveys include these species as well. The presence or absence of these species in the project impact areas should be addressed in the environmental assessment. We encourage you to consider alternatives which minimize impacts to these species and their habitats that may be present in the area of affect of the project. (**0045-7** [Hall, Timothy N.])

***Response:** The Federally listed endangered smooth coneflower (Echinacea laevigata) was not noted as a species of interest to the U.S. Fish and Wildlife Service (FWS) in its letter to Duke on May 23, 2006. Thus, botanical surveys of the Lee site conducted to date have not included this species. The NRC staff will contact the FWS to confirm this species recorded location near the Lee site. The potential for the species' occurrence onsite will be assessed based on the species' habitat affinities and whether such habitats were observed onsite during the surveys conducted to date. The decision to conduct surveys for the smooth coneflower onsite will be made at that time. If surveys are conducted, the results will be described in Chapter 2 of the EIS. If the species is present onsite, potential impacts and any impact avoidance, minimization, or mitigation measures will be addressed in Chapter 4.*

Comment: Potential impact to migratory bird populations and movement should also be analyzed. We are concerned about impacts of potential bird collisions, or electrocution. We believe that a monitoring program should be developed consistent with the MOA between the [U.S. Fish and Wildlife] Service and NRC for migratory birds. Since bald eagles, osprey, black and turkey vultures, and herons frequent the project vicinity, we recommend any associated transmission lines or distribution lines crossing wetlands, large bodies of water, or open areas should be maintained to maximize visibility of the line to raptors by one of the following design modifications: (1) remove the static line; (2) enlarge the static line to improve visibility to raptors; or (3) mount aviation balls or similar markers on the static line. How will stormwater basins, settling ponds, lagoons, and other storage facilities be designed and managed to minimize impacts to migratory birds, including waterfowl? (**0045-8** [Hall, Timothy N.])

Response: *The design of the transmission lines is outside the scope of this review, as the NRC does not license transmission line construction. Therefore, design alternatives will be not be evaluated in the EIS; however, the potential impacts to migratory birds and mitigation measures will be evaluated in the cumulative effects section of the EIS. In addition, the potential effects of any stormwater basins, settling ponds, lagoons, or other such storage facilities on migratory birds (including waterfowl), and any mitigation measures to reduce such impacts, will be addressed in Chapter 5.*

Comment: We are concerned about the effects of night security lighting. We are primarily concerned about the potential for overlighting the large site and the potential adverse effects on fish and wildlife resources in the area, including migratory birds and bats. A dark nighttime sky is essential. Contributions of light from the earth (both direct emissions and reflected light) brighten the night sky background. This brightening also greatly diminishes the view of the sky for migrating birds, moths, bats, and the general public. (**0045-9** [Hall, Timothy N.])

Response: *Potential impacts on wildlife—including migratory birds and bats—from nighttime security lighting will be addressed in Chapter 5 of the EIS.*

Comment: We are also concerned with the introduction and spread of invasive exotic species in association with the proposed project. Without active management, including the revegetation of disturbed areas with native species, project corridors will likely only be sources of (and corridors for) the movement of invasive exotic plant species. Despite their short-term erosion-control benefits, many exotic species used in soil stabilization seed mixes are persistent once they are established, thereby preventing the reestablishment of native vegetation. Many of these exotics plants are also aggressive invaders of nearby natural areas, where they are capable of displacing already established native species. Therefore, we strongly recommend that only native plant species be used in association with all aspects of this project, including secondary impacts (i.e., connecting sewer lines). (**0045-12** [Hall, Timothy N.])

Response: *The potential impacts of construction, including impacts due to exotic species invasion and seeding non-native species in disturbed areas to control erosion, will be addressed in Chapter 4 of the EIS or as a cumulative effect as appropriate. The minimization of such impacts via seeding or otherwise facilitating the re-establishment of native vegetation in disturbed areas will also be addressed in Chapter 4.*

Comment: 2.4.1 Terrestrial Ecology, page 2.4-2. The ER references the Cherokee Nuclear Station Environmental Report (Cherokee ER) issued by Duke Power Company on October 13, 1975. However, Duke has not provided the Cherokee ER as an Appendix for reference. Since Duke relied heavily on the results of the Cherokee ER in the development of the ER for the Lee Site, it will be necessary to review the Cherokee ER. Likewise, the ER references a 2006 *reconnaissance* study of terrestrial species and resources, but has not provided methods and study results in the form of an appended technical report. This information will be needed to appropriately evaluate the scope, intensity and effort of cited studies as conducted to support the license application. (**0046-6** [Perry, Robert D.])

Comment: 2.4.1.1 Existing Cover Types, page 2.4-2. The ER indicates *previous terrestrial ecological conditions were extensively altered by grading and construction for the Cherokee Nuclear Station*. These impacts should be included in the discussion of terrestrial impacts of construction in Chapter 4. (**0046-7** [Perry, Robert D.])

Comment: 4.2 Water Related Impacts, page 4.2-1. The ER states construction related impacts to wetland areas are expected to be small because the site requires few changes to aquatic habitats to accommodate the construction of a new plant, since *much of the potential water-related modifications of this site were made during original construction of the Cherokee plant.* It is not known whether a Section 404 permit was issued for the construction of the Cherokee plant and whether mitigation for these initial impacts was required or provided at that time. The existing impoundments and construction foundation for the 2 future nuclear units will be utilized for the active operation of the Lee Nuclear facility. These impacts are significant and should be included in environmental impacts due to construction to ensure that total impacts to waters of the US may be appropriately evaluated and mitigated. For example, <u>a cursory review of USGS topographic maps indicates that [plus or minus] 11,000 lf of perennial and intermittent stream were filled and flooded for the construction of the impoundments alone</u>.
(**0046-21** [Perry, Robert D.])

Response: *The Cherokee Nuclear Station Environmental Report (Cherokee ER; Duke Power Company 1974) and the Section 404 Permit will be reviewed in light of information presented by Duke in its ER for the Lee COL. These documents will be used to develop the Lee COL EIS and will be referenced appropriately. Impacts of construction of the Cherokee facility will be addressed in the cumulative effects section of the EIS. A report documenting the methods, level of effort, and results of the reconnaissance field surveys (referenced by Duke in its ER for the Lee COL) has been requested from Duke and will also be evaluated to develop the Lee COL EIS.*

Comment: 2.4.1.1.1 Alluvial and Other Wetlands, page 2.4-6. Jurisdictional and nonjurisdictional wetlands have been identified onsite and Duke obtained an Approximate Jurisdictional Determination by the US Army Corps of Engineers on September 24, 2007. The ER indicates a Section 404 permit will not be required for further construction because none is planned within identified jurisdictional wetlands. However, a finalized construction plan has not been provided. It should also be noted that alluvial wetlands along the fringe of the impoundments will be periodically impacted as pond levels are influenced by project operations. (**0046-9** [Perry, Robert D.])

Response: *Detailed construction plans have been requested from Duke, particularly for those activities that could potentially affect wetlands. The potential impacts to wetlands, including those that are jurisdictional, from construction and the need to obtain a Section 404 Permit from the U.S. Army Corps of Engineers will be evaluated in Chapter 4 of the EIS or as a cumulative impact as appropriate. Potential impacts to the littoral wetlands located along the margins of Make-Up Ponds A and B due to water use by the proposed two new reactors, particularly during drought periods, will be evaluated in Chapter 5 of the EIS.*

Comment: 2.4.1.3.1.1 Plants, page 2.4-16. A population of the southern adder's tongue fern (*Ophioglossum vulgatum*), a state species of concern, was identified onsite during the 2006 reconnaissance. A management plan for the southern adder's tongue fern population and any other protected plant species located within the project boundary should be provided for review by resource agencies. (**0046-10** [Perry, Robert D.])

Response: *The potential impacts of construction and operation to the population of southern adder's tongue fern (*Ophioglossum vulgatum*), a state species of concern identified in Duke's ER, will be evaluated in Chapters 4 and 5 of the EIS, respectively. If the population of this species could be affected, the possibility of development of a management plan will be addressed in the EIS. However, if there are no potential impacts to this population, the development of a management plan would be out of the scope of the NRC's review of the EIS. The DEIS will be sent to appropriate agencies for review.*

Comment: 2.4.1.3.4 Critical Species, page 2.4-20. The ER states *Because of the wide variety of ecological communities within the region, the abundance of individual species, especially plants, can vary significantly from location to location where different species serve similar ecological roles in the community. Accordingly, there is no evidence suggesting that any individual species is critical to structure or function at the ecosystem level.* It is not clear from this statement how it is concluded there are no onsite species critical to local or regional ecosystem structure or function. (**0046-11** [Perry, Robert D.])

Comment: 2.4.1.3.5 Biological Indicators, page 2.4-20. The ER indicates *there are no species at the site that might function as true bioindicators*. Again, this conclusion seems to be drawn from the assertion that species onsite are common to southeastern forests, and to the lack of population information available for the less common species allowing biologists to track future status changes. The use of a species as a biological indicator is habitat-dependent. The ER does not indicate whether or not species were evaluated by habitat type (alluvial wetland, shoreline, upland, mixed hardwood forest, etc.). As with critical species, the regional commonness of a species does not necessarily correlate to its value as a biological indicator at the habitat level.

The lack of available population information on rare species does not preclude the applicant from the need to provide information on the presence of species essential to ecosystem function or of value as a biological indicator. Indeed, the lack of information points to the need for ongoing study and monitoring of species occurrence and use of resources by habitat type, both before and after construction. (**0046-12** [Perry, Robert D.])

Response: *Sections of the ER pertaining to terrestrial ecology will be evaluated for their utility in developing the EIS and will be used accordingly. The staff will perform an independent assessment of the impacts on terrestrial species and will present their findings in Chapters 4 and 5 of the EIS.*

Comment: 10.1.1 Unavoidable Adverse Environmental Impacts of Construction, page 10.1-1. The list of hydrological and water use impacts due to construction of the facility should include wetland areas within the footprint and adjacent to the initial construction site of the Cherokee plant and the linear footage of perennial and intermittent streams that were filled and flooded for the construction of the onsite impoundments.

10.1.2 Unavoidable Adverse Environmental Impacts of Operations, page 10.1-2. The list of hydrological and water use impacts due to operation of the Lee Nuclear facility should include those imposed upon aquatic life, wetland areas and shoreline adjacent to Make-up Ponds A and B as pond levels fluctuate.

The list of ecological impacts due to operation of the Lee Nuclear facility also should include those incurred through habitat fragmentation and degradation, obstruction of migration corridors and noise and human activity.

The ER does not indicate that in-kind alternatives have been identified to mitigate for direct wetland and other natural resource impacts. In order to adequately mitigate all identified and yet-to-be-identified impacts, including the likelihood of secondary impacts, a mitigation plan should be developed for the Lee Site and facility construction/operation. Such a mitigation plan may need to encompass more than simple wetland impact mitigation or compensation. DNR will request coordinated mitigation planning and identification of the need to address future negative secondary impacts to fish and wildlife resources as well as loss of public recreational opportunities related to the Lee Nuclear facility. (**0046-27** [Perry, Robert D.])

Response: *The potential impacts to wetlands (including those around the margins of Make-Up Ponds A and B), riparian areas, streams (including shorelines), including habitat degradation and fragmentation, obstruction of migration corridors, etc. that could result from construction and operation, will be described and evaluated in Chapters 4 and 5 of the EIS. Mitigation, including the possibility of in-kind alternatives and mitigation planning, will be addressed in Chapters 4 and 5 as appropriate. Where these impacts represent unavoidable losses of natural resources, they will be summarized in Chapter 10. Impacts of the initial construction of the Cherokee plant will be addressed in the cumulative effects section of the EIS.*

D.1.2.8 Comments Concerning Ecology - Aquatic

Comment: Another problem with water discharged from nuclear plants is its temperature. This water is warmer than the water into which it is discharged, and the resulting thermal plumes cause stress to aquatic life which can include commercially important fish and shellfish. (**0001-22** [Barczak, Sara])

Comment: Another problem with water discharged from nuclear plants is its temperature. This water is warmer than the water into which it is discharged, and the resulting thermal plumes cause stress on aquatic life, which can include commercially important fish and shellfish. Warmer water temperatures proximate to a nuclear power plant result in conditions that effect the feeding and breeding patterns of various species. For instance, nuclear power plants aggravate the problem of low dissolved oxygen levels through its heated discharge to lakes and rivers. The NRC needs to study these impacts. (**0010-2, 0049-10** [Barczak, Sara])

Comment: We are particularly interested in understanding if the nuclear facilities will alter the physical, hydrologic, thermal or chemical characteristics of the Broad River in ways that might alter, prevent or delay the upstream or downstream movements of these species. The EIS should specifically address whether river water temperatures would disrupt the upstream migrations during April and May. Although the warm-water plume may not be extremely high, the difference in temperature may act as a behavioral barrier to movements. (**0037-2** [Goudreau, Chris])

Comment: Water returned to the Broad River is likely to have a substantial temperature variation from the Broad River. A sudden change is the thermal environment may be hazardous to aquatic organisms near the outflow as well as those downstream. The EIS must address these impacts and provide alternatives to eliminating or reducing aquatic thermal variations (**0045-3** [Hall, Timothy N.])

Comment: DNR has concern related to thermal impacts to all aquatic species as related to operation of the proposed Lee Nuclear facility at the thermal discharge site above the Ninety-Nine Islands dam as well as below in the Broad River (**0046-25** [Perry, Robert D.])

Response: *The NRC staff will assess potential impacts to aquatic life in the Broad River from thermal discharge of the proposed Lee units in Chapter 5 of the EIS.*

Comment: Recently, the NCWRC, along with the South Carolina Department of Natural Resources, U.S. Fish and Wildlife Service, Duke Energy, and South Carolina Electric and Gas, signed an agreement for the protection, restoration, and enhancement of diadromous fish in the Santee Basin in South Carolina and North Carolina. American shad and American eel migrations historically extended into the North Carolina portion of the Broad River sub-basin. While work will be done in other portions of the Santee Basin, the initial focus of the restoration work will occur in the Broad River sub-basin. Over time, we expect that other downstream blockages to movements of these species will be reduced or eliminated. We want to ensure that operation of the proposed Lee Nuclear site will not create any additional impediments to the upstream and downstream migrations of these species. We did not find any analyses in the Environmental Report prepared by Duke Energy regarding the potential effects on diadromous species. When diadromous species arrive at the project site in the future, monitoring should be required to make sure they are not stopped, slowed down or otherwise affected by operation of the facility. (**0037-1** [Goudreau, Chris])

Response: *Although it can recommend ecological monitoring, the NRC does not have the authority to require post-operational monitoring on the part of the applicant. However, the NRC staff will evaluate potential impacts of operation of the proposed Lee units to the aquatic environment, including potential impacts to diadromous fish species in the Broad River. The results of the analysis will be presented in Chapter 5 of the EIS.*

Comment: The potential for the cooling water intakes to impinge or entrain larval and juvenile stages of both species should also be addressed. Should South Carolina DENR not have intake specifications, we routinely recommend the use of passive screens with openings not to exceed 1 centimeter (1 millimeter in waters having anadromous fish) and with a maximum intake velocity of 0.5 feet per second. (**0037-3** [Goudreau, Chris])

Comment: One of several issues associated with a large water intake includes impingement and entrainment of aquatic organisms at the cooling water intake. Previous studies at similar nuclear sites by Duke found impingement of some fishes, mostly threadfin shad, some bluegill, and alewife, most during periods of cold water. Although these impacts may be considered small, we recommend that the licensee establish a regular monitoring program and develop a strategy to reduce impingement and entrainment, and to mitigate these potential impacts. Methods to prevent entrainment of aquatic species such as appropriate screen sizes, low pump velocities or variable operation schedules during power operations to block biotic intake must be detailed in the EIS. (**0045-4** [Hall, Timothy N.])

Response: *The applicant's proposed cooling water intake design and the potential for impingement and entrainment of aquatic organisms from operation of the proposed nuclear units will be evaluated, and the results will be presented in Chapter 5 of the EIS.*

Comment: 2.4.2.1. Aquatic Habitats, page 2.4-24. DNR disagrees with the statement that *neither the river nor Ninety-Nine Islands Reservoir is a significant aquatic habitat in a regional context*. In 1988 the South Carolina Water Resources Commission (SCWRC) prepared a Rivers Assessment (RA) of the Broad River as a part of the South Carolina Rivers Assessment initiative. The RA provides an analysis of each river in SC, based on a number of categories, including (1) Historic and Cultural, (2) Industrial, (3) Inland Fisheries, (4) Recreational Fishing, (5) Timber Management, (6) Water Supply and (7) Wildlife Habitat. Criteria for designation of the Broad River included scenic value (lack of visual obstructions by structures); absence of wastewater dischargers; outstanding fishing quality and aquatic habitat; water quality; and wildlife habitat quality. <u>The RA rated the Broad River as an outstanding river of regional significance in all of these categories</u>. (**0046-13** [Perry, Robert D.])

Response: *The comment relates to the importance of the Broad River's aquatic habitat in a regional context. The NRC staff will provide its own independent discussion of the aquatic environment in the vicinity of the proposed new nuclear units and its importance in a regional context in Chapter 2 of the EIS.*

Comment: 2.4.2.4 Mussels, page 2.4-30. The paper pond shell mussel (*Utterbackia imbecellis*) a species of state concern, occurs in Makeup Pond A. This species may be impacted by siltation, dredging and fluctuations in pond elevations due to project operations representing an adverse impact for which mitigation should be provided.
(**0046-14** [Perry, Robert D.])

Response: *The comment is related to the potential impacts of construction and operation of the proposed new nuclear units on the paper pondshell mussel (Utterbackia imbecillis), which occurs in Make-Up Pond A. Assessment of this species in addition to other aquatic organisms will be presented in Chapters 2, 4, and 5 of the EIS.*

Comment: 2.4.2.5.5. The ER states *Because the habitats of the Lee Nuclear Site are widespread within the region, the abundance of an individual aquatic species can vary significantly from location to location where different species serve similar ecological roles in the aquatic community. Accordingly, there is no evidence suggesting that any individual species is critical to structure or function at the ecosystem level*. How does this lead to the conclusion that there are no species that are critical to ecosystem structure or function at the Lee site? What specific criteria were used to evaluate individual species function by habitat type?
(**0046-15** [Perry, Robert D.])

Response: *The NRC's responsibilities under NEPA are to provide a fair and comprehensive analysis of potential impacts related to the proposed action, evaluate alternatives, and discuss potential mitigation measures as appropriate. In the Lee COL EIS, the NRC will provide an independent evaluation of the importance of various aquatic species found in the vicinity of the Lee site to ecosystem structure and function.*

Comment: We are also concerned with the fauna and aquatic fauna of this river and would ask that the thermal water aspects of this project be studied and included in the environmental impact study document. We recommend further analysis for potential impacts to the flora and fauna of the river ecosystem, especially any impacts to rare, threatened and endangered species. (**0042-4** [Crockett, Mary])

Response: *The NRC staff will assess potential impacts from thermal discharge of the proposed Lee units on aquatic biota in the Broad River. The results of the evaluation will be presented in Chapter 5 of the EIS. The NRC will also evaluate potential impacts to rare, threatened, and endangered species from construction and operation of the proposed new nuclear units. This information will be presented in Chapters 2, 4, and 5 of the EIS.*

Comment: 2.4.2.5.6 Biological Indicators, page 2.4-34. DNR agrees the primary use of an indicator is to characterize current status and track or predict significant change within a habitat or ecosystem. Therefore it is recommended there be periodic monitoring of macroinvertebrates and other sensitive aquatic species above and below the Ninety-Nine Islands dam and within onsite impoundments to track impacts of project operations to aquatic resources.

2.4.2.5.8 Other Aquatic Species of Special Interest. DNR recommends Duke conduct periodic fish surveys above and below the dam and within onsite impoundments to track impacts of project operations to aquatic resources.

NRC should be aware of a recently ratified cooperative diadromous fish passage agreement (Accord) between Duke, South Carolina Electric & Gas, DNR, North Carolina Wildlife Resources Commission and United States Fish and Wildlife Service. This agreement is intended to protect, restore and enhance diadromous fish in the Santee River Basin with particular emphasis to the Broad River sub-basin. DNR and other signatories of the Accord will require assurance construction and operation of the Lee Nuclear facility will not be an impediment to the Accord and its objectives including up and down stream migrations of diadromous fish. (**0046-16** [Perry, Robert D.])

Response: *Although it can discuss ecological monitoring, the NRC does not have the authority to require post-operational monitoring on the part of the applicant. However, the NRC staff will evaluate potential impacts of operation of the proposed Lee units to the aquatic environment, including potential impacts to diadromous fish species in the Broad River. The results of the analysis will be presented in Chapter 5 of the EIS.*

Comment: 4.3 Ecological Impacts, page 4.3-1. The fact that many of the construction impacts occurred during the construction of the Cherokee plant before construction was halted does not obviate the need to provide appropriate mitigation and compensation for these impacts. These impacts should be included in total ecological impacts due to construction of the Lee Nuclear facility. (**0046-22** [Perry, Robert D.])

Comment: 5.2 Water-Related Impacts, page 5.2-1. In response to the statement *Evaluations specific to the Lee Nuclear Site are consistent with previous conclusions: water related impacts during plant operations are SMALL and mitigation is not warranted*. DNR will evaluate future applications for Federal and state permits associated with the proposed Lee Site for impacts to aquatic resources. Avoidance and minimization of adverse impacts and mitigation and compensation for unavoidable impacts is required under Sections 401 and 404 of the US Clean Water Act. (**0046-23** [Perry, Robert D.])

Response: *The NRC's responsibilities under NEPA are to provide a fair and comprehensive analysis of potential impacts related to the proposed action, evaluate alternatives, and discuss potential mitigation measures as appropriate. Approval of other Federal and State permits associated with the proposed new nuclear units and any requirements for mitigating actions will be the responsibility of the permitting agencies. Impacts of construction of the Cherokee facility will be addressed in the cumulative effects section of the EIS.*

Comment: We understand that the volume of water taken for facilities of this type generally exceed the volume returned. Much of the water used in cooling operations will be lost through evaporation. Therefore, the EIS must analyze impacts to downstream habitats and species as a result of this water loss. We encourage you to develop an instream flow study plan that considers the potential effects of these consumptive losses across the full range of flow scenarios. How will the water abstraction impact the physical habitat of fish and other aquatic community members? We will be glad to review and participate in the development of an appropriate instream flow study to consider the potential effects on aquatic species, their habitats, and community assemblages. Please design your study to consider the potential effects to focal restoration species like American shad and American eel, rare species like the robust redhorse, and less mobile taxa such as freshwater mussels, as well as riverine guilds, and natural community assemblages (**0045-2** [Hall, Timothy N.])

Response: *The impact of water withdrawals from the Broad River for operation of the proposed new nuclear units will be evaluated and presented in Chapter 5 of the EIS.*

D.1.2.9 Comments Concerning Socioeconomics

Comment: This [William States Lee Nuclear] facility also has a significant benefit to the economy of South Carolina and Cherokee County. This multi-billion dollar investment in the county will bring over 2000 construction jobs, over 800 full time jobs during its operating life. It will contribute positively to the economy of Cherokee County and neighboring counties. The facility will also provide many high paying jobs for citizens of Cherokee County and South Carolina. (**0001-7** [Moss, Dennis Carroll])

Comment: [The Lee] facility will have a significant positive impact on the economy of Cherokee County, surrounding counties and South Carolina. The multibillion investment in Cherokee County will bring over 1000 construction jobs and over 800 high paying full time jobs during its operation. (**0001-38** [Moorhead, Gene])

Comment: I understand Lee Nuclear Station will have around the same number of employees, along with those well-paying salaries. Also, the economic impact study by the Nuclear Energy Institute tells us that over 700 of those 1000 employees will live in the same county. So the salaries stay locally. (**0001-46** [Hardy, Chris])

Comment: [T]here's going to be about 1800 to 2000 jobs during construction and probably 800 long-term. An average power plant does provide 20 to 30 million dollars of tax revenue in the state's economy, things that help schools, things that help those that need it. (**0001-78** [Blue, Lilly])

Comment: [The Spartanburg Chamber of Commerce] endorsement goes beyond the obvious economic benefits of the design, construction and operation of the Lee Station. (**0001-88** [Cordeau, David])

Comment: [M]ore than 2000 manufacturers provide jobs to tens of thousands of upstate South Carolinians. One of the principal reasons that those companies are here and continue to come here is that we have had an abundant and affordable supply of energy in this area (**0001-91** [Gossett, Lewis])

Comment: [A] lot of companies don't like to talk publicly about the fact that they could shut down and they could cost the community jobs. For a lot of those companies, they will never get to that decision because unreliable power, something they can't count on in the future, is the thing that will force them to relocate. We've seen enough of that in this region. Another reason is affordability. We do have some of the most affordable rates in the country in this area and that makes a big, big difference when companies are thinking about locating and staying here. That is one of the big cost drivers and it's something that we must maintain if we are to continue to compete with parts of the world that have other costs that are so dramatically lower than ours. (**0001-93** [Gossett, Lewis])

Comment: [I]f you realize, as we do, that there's a lot more room for growth and there's a lot more room for opportunities for this generation and for future generations, then this plant is something that you should support and you should embrace. It's exciting that they've chosen

Cherokee County, I'm glad that not only are they going to provide the jobs here, but they're going to provide the power that the jobs that will be generated as a result will need. (**0001-98** [Gossett, Lewis])

Comment: I truly understand and appreciate what this project will provide in the way of jobs for our citizens, both in the construction phase and in the operations phase. During the operations phase, we heard numbers of up to 800 workers. These employees will have competitive salaries based on their skills and training. These high wage, high skill jobs will have a profound positive impact on the per capita income of this community. (**0001-111** [Forrester, Mike])

Comment: The building of this facility will also help continue a long Duke Energy tradition of providing affordable energy rates for business and industry. (**0001-112** [Forrester, Mike])

Comment: Today seven nuclear reactors at four sites generate 52 percent of South Carolina's electricity. I ask the regulators to consider how these communities have been changed by the presence of those facilities. I believe you'll find that these communities have enjoyed increased economic output, improved community infrastructure and a peace of mind garnered from years of nothing but positive actions from their corporate neighbors. (**0001-150** [Murphy, William])

Comment: The Spartanburg Chamber believes that this facility will also benefit the economy of the Upstate and of South Carolina. The potential investment in the region will have considerable impact, not only in Cherokee County, but in neighboring Counties like Spartanburg. Development of the Lee Station in the Upstate will bring thousands of construction jobs, additional services, and hundreds of high paying, full-time jobs during the actual operation of the plant. There is no doubt that the project will make a major contribution to the economy of Cherokee County, Spartanburg County and neighboring counties in the region. (**0011-4** [Cordeau, David])

Comment: The Lee Nuclear Station will provide significant benefits to South Carolina's economy and has broad support from citizens within the community who stand to directly benefit from the construction and operation of this facility. Duke Energy's multi-billion dollar investment in South Carolina will bring more than 3,000 construction jobs and over 800 full-time jobs, contributing positively to the economy of Cherokee County, as well as neighboring counties, during its operating life. Additionally, as we have seen at other facilities, station employees will contribute to their communities in many ways, including financially and through volunteer and service commitments. (**0013-2** [Barrett, J. Gresham] [Brown, Henry E.] [Clyburn, James E.] [DeMint, Jim] [Graham, Lindsey] [Inglis, Bob] [Spratt, John M.] [Wilson, Joe])

Comment: This facility also has a significant benefit to the economy of South Carolina and Cherokee County. This multi-billion dollar investment in the County will bring over 2000 construction jobs and over 800 full-time jobs during its operating life. It will contribute positively to the economy of Cherokee County and neighboring counties. The facility will also provide needed high paying jobs for the Citizens of Cherokee County and of South Carolina. (**0016-3** [Cook, Jim])

Comment: During construction, thousands of workers with different skills will be required. Operations at the Lee Station could employ approximately 1,000 workers. These employees will have competitive salaries based on their skills and training. I can attest to the positive economic development impact that the Oconee Nuclear Station has had in Oconee and Pickens Counties. I am absolutely sure that the addition of Lee Nuclear Station to Cherokee County will stimulate economic development in the entire region, in both direct spending and in economic activity generated by the plant and its employees. (**0018-4** [Sandifer, Bill])

Comment: The addition of Lee Nuclear to Cherokee County will support economic development. Nuclear plants substantially contribute to local and state economies, both directly and indirectly. (**0023-2** [Peeler, Harvey S.])

Comment: The proposed facility disclosed to Cherokee County by Duke Energy will have a significant benefit to the economy of Cherokee County and South Carolina. (**0024-2** [Batchler James D.; Foster, Rufus H.; Humphries, H. Baily; Little, Quay; Mathis, Charles; Parris, Hoke; Spencer, Tim])

Comment: Access to affordable, reliable energy is a critical factor in attracting future business investment and maintaining our state's healthy economy. Without new capacity to produce more energy, South Carolina's economic growth potential could be jeopardized as business and industry choose to halt expansion plans or invest elsewhere. Beyond supporting current economic activity and future development, the Lee Nuclear Station will, itself create thousands of new jobs during construction and could generate more than 1,000 high-paying jobs once the facility is operational. (**0030-3** [Taylor, Joe])

Comment: This facility is also a benefit to the economy of South Carolina. This several billion dollar investment in South Carolina will bring over 2000 construction jobs and over 800 full-time jobs during its operating life. It will also contribute positively to the economy of Cherokee County and neighboring counties over its lifetime. (**0047-3** [Vogel, Chip])

Comment: The economies of both counties have been under attack over the last decade with the loss of a tremendous number of textile and industrial jobs. Most of these jobs have been outsourced overseas, and we are fighting a battle to replace the jobs and the investment. One of the key attractions to our area are competitive electrical rates, the availability of power and the existence of excess capacity in our system grid. Adding the Lee Nuclear Plant to this grid is key to our being competitive in this world economy. (**0048-1** [Chapman, A. Foster])

Response: *These comments generally express support for the proposed action based on the potential positive socioeconomic impacts it would be expected to bring to the region. Socioeconomic impacts of construction and operation will be addressed in Chapters 4 and 5 of the EIS.*

Comment: We have hundreds and hundreds of empty factories and empty warehouses throughout South Carolina and North Carolina due to textile industries and furniture industries leaving this area. We have thousands and thousands of workers that would love to be building solar panels and wind turbines that are now being produced in other countries by the thousands. We are losing this economic battle and we're going to end up in a situation where the 800 jobs Duke says are going to be at the nuclear plant -- which by the way, I contest. From what I understand, it will probably be more like 200 permanent jobs, it's not worth it. (**0001-36** [Cherin, Mike])

Comment: The next issue is jobs. This is a major federal activity and I'll go back to this, but this is now federal dollars being spent, not just the industry's money. This is major federal actions that Congress is spending taxpayers' money on. By my calculations, this evening we heard that it was going to be 800 permanent jobs. If there's a cut-rate deal on the AP1000 and Duke gets one for $8 billion --that's for one unit, so I'm assuming the 800 jobs is for two units, so that would be 1600, so double my number because it comes out to $800 million a job and you double that, 16? No, even higher, I can't do the math in my head. So how much money per job are we talking about here? It's astronomical. We need to look at the relative ability to create jobs from other possible energy sources. And I commend to you a report by the Tennessee Valley Authority, because TVA has generating capacity in solar, in wind, in hydro, in coal, in gas and in nuclear. And in fact, if you look at their studies, you will find that you will get more jobs per kilowatt-hour and offer more cost effective electricity for the consumer in every other form of power generation. Nuclear has the least jobs per kilowatt-hour. Please include and reference the TVA document in your EIS. (**0001-51** [Olson, Mary])

Comment: Energy was cheap when all the jobs left, when our country decided to do this free trade, gobblization as a friend of mine renamed it, NAFTA stuff. That's where all the jobs went. They didn't go because of energy cost. Cheap energy isn't going to bring the jobs back. (**0001-179** [Minerd, Leslie])

Comment: The enticement of jobs is false hope for people in this area. Everyone knows that trained people will be brought in from the outside to work the facility just like BMW, TNS Mills. (**0026-3** [Poole, Mary Jane])

Response: *Socioeconomic impacts, such as labor impacts associated with the construction and operation of the Lee Nuclear Station, will be addressed in Chapters 4 and 5 of the EIS.*

Comment: Duke Power depreciated the Catawba nuclear facility off the tax books at the end of 30 years, which was supposed to be the life of the plant. The NRC, however, chose to relicense this plant. But York County taxes did not return to the original income for this facility. Therefore, we are exposed to the risk but do not now reap the benefits of tax revenue from this plant. We will also be left with the eternal legacy of the site after closure.
(**0001-193** [Connolly, Mary Ellen])

Response: *The NRC is not involved in establishing energy policy; rather, it regulates the nuclear industry to protect public health and safety within existing policy. Issues related to taxes are outside of the NRC's mission and authority and are not addressed in the EIS. The socioeconomic impacts will be addressed in Chapters 4 and 5 of the EIS.*

Comment: The question is, you know, what's a fair balance between having this water that's lost to generate nuclear energy and the loss to those that need to generate renewable hydro-generation, hydroenergy. And there's not a good answer to that, but there's a few ways -- I guess the concern that I've got is that somehow mitigation needs to be taken into account in this environmental effort, the review that's about to take place. There's several different ways to fix the problem and strike a fair balance. I'm not proposing any particular one or promoting any particular one. There may be a way to create a rain catchment area so that makeup water can be put back into the river as it's lost through evaporation. Alternatively, it may be possible to have deep well pumping to do the same function. That's not necessarily a great solution either. I don't know if there is a great solution. At the very least, you know, if this site is going to be built and what basically is free fuel to those hydro-generators downstream is lost, then perhaps some kind of straight-forward financial reimbursement would be the best way to go. (**0001-101** [Stone, Bryan])

Response: *This comment expresses concern regarding the availability of an adequate supply of water in the area to support both the two new reactors and any downstream hydro plants. This topic will be addressed in Chapter 5 of the EIS.*

Comment: We are also concerned with possible economic or cumulative affects growth and/or development to the currently rural areas of the county and around the river this project may bring. This project may cause further development around the river in the form of housing subdivisions and infrastructure which may impact the scenic viewshed and environmental health of the river. We ask that you study these impacts and include them in your document.
(**0042-5** [Crockett, Mary])

Response: *The EIS will include an evaluation of the socioeconomic and environmental impacts of operating a nuclear plant at the Lee site on the region. The evaluation will include both aesthetic and housing impacts.*

D.1.2.10 Comments Concerning Historic and Cultural Resources

Comment: I'm sure the Cherokee Indians may have an interest in what's going on with this river because much of their history is there. (**0001-195** [Connolly, Mary Ellen])

Response: *The NRC has initiated consultation with the Eastern Band of the Cherokee Indians in accordance with Section 106 of the National Historic Preservation Act of 1966 and NEPA and will continue to do so throughout the EIS process.*

Comment: We have been in informal comments with Duke Energy and the NRC on this project for the past year, and we have reviewed and commented on several cultural resources surveys conducted to identify potential historic properties at the Lee Nuclear Plant site. Based on our conversations and the review of these documents, it is the opinion of our office that a programmatic agreement or some other type of formal agreement may be the best way to handle historic properties and cultural resources at the Lee Nuclear Plant site.

We understand that not all aspects of the construction and operation of the plant will be finalized at the time of the granting of the license. In our opinion, the agreement should include:

- The survey and historic property identification within additional Areas of Potential Effect (APE) as identified for discharge structures, transmission lines, roads, etc.
- Management of the property as well as future construction over the 40 year term of the license
- The handling of late discoveries and future consultation (**0043-1** [Dobrasko, Rebekah])

Comment: There was some question about the State Historic Preservation Office's (SHPO) recommendation for a programmatic agreement to cover future work/potential effects at the site. Our recommendation is based on 36 CFR 800 Protection of Historic Properties. Based on 36 CFR 800.14 (b)(1), the regulations specify that a programmatic agreement may be used when: Effects on historic properties cannot be fully determined prior to the approval of an undertaking and when nonfederal parties are delegated major decision-making responsibilities. Since the discharge structures, transmission lines, roads, etc. related to the construction of the Lee Nuclear Plant are not yet defined, and most likely will not be defined prior to the issuance of a COL, then it is the SHPO's opinion that any effects to historic properties cannot be determined prior to the undertaking. Also, Duke Energy will be responsible for the surveying and reporting aspects of this project, so in our opinion, a programmatic agreement between the NRC, the SHPO, Duke Energy, and any other interested parties, such as any Native American tribes, may be appropriate in this case. (**0044-1** [Dobrasko, Rebekah])

Response: *The NRC intends to work with the SHPO on the request to formalize an agreement on future activities, but at this time the exact mechanism for this agreement is still being discussed.*

D.1.2.11 Comments Concerning Health - Radiological

Comment: How can these proposed reactors assure safeguard against emissions which were previously considered too minute to cause cancer? (**0001-143** [Patrie, Dr. Lew])

Comment: All nuclear power plants leak and emit toxins and nuclear cancer-causing pollutants into the air, water and the soil. (**0001-196** [Connolly, Mary Ellen])

Comment: I am concerned about radioactive emissions. (**0005-3** [Craig, Anne])

Comment: Tritium has been linked to developmental problems, cancers, genetic defects, miscarriages and damage to fetuses even at low levels. What is the NRC's specific dose estimates for tritium (radioactive hydrogen and Nobel gases for all metropolitan areas within 100 miles (INCLUDING MY GRANDCHILDREN!). (**0007-8** [Arnason, Deb])

Comment: Tritium like Duke leaked. Anyone done an independent study of leukemia in the area of Duke leak? Charlotte Observer, Thurs. Oct 11, 2007. Near my Grandchildren on well water!! (**0008-4** [Arnason, Deb])

Comment: Air quality: Please supply specific dose estimates for tritium and Nobel gases for all metropoilitan [metropolitan] areas within 100 miles. (**0034-2** [Karpen, Leah R.])

Comment: What are the specific dose estimates including tritium and Nobel gases for all areas within 100 miles? (**0038-2** [Turk, Lawrence "Butch"])

Response: *Emission estimates will be based on the approved AP1000 Design Control Document (Westinghouse 2008); these emission estimates are anticipated to be conservative (that is, they will overestimate emissions). The human health and environmental impacts of the emissions will be addressed in Chapter 5 of the EIS.*

Comment: Duke alone already operates five reactors in South Carolina and several more nearby in North Carolina. Further, a host of nuclear waste and nuclear industrial operations are here in South Carolina. The Savannah River Site near Aiken is the most radioactive Department of Energy site in the nation. The Barnwell nuclear dump is also a radioactive hot spot. And nowhere in the application does it discuss the cumulative impacts of having all these facilities operating in South Carolina. It does not discuss the cumulative health impacts to Carolinians. The NRC must address these cumulative impacts to human health in the draft EIS. (**0001-23** [Barczak, Sara])

Comment: The first is the Part 20 radiation standards that are the federal government's protection to the populations that are impacted by these activities that do release radioactivity into the air, into the water, generate waste and sewage, radioactive sewage, and the allied activities that support the facility also have all these emissions. I'm deeply concerned that this area is already impacted by nine nuclear power plants and two more being added will make eleven and I know that every piece of data that you will hand me says that the operations are below the Part 20 standards. You need to look at the fact that you allow those levels. If those levels are allowed, can that kind of activity meet your standards -- being the federal regulators that I'm speaking to. So it's not only this community, there's Charlotte, there's Columbia and we have to consider the Savannah River Site in that calculation. (**0001-50** [Olson, Mary])

Comment: As the NRC is aware, Duke already operates five reactors here in SC and several more nearby in NC. Further, a host of nuclear waste and nuclear industrial operations are here in SC. The Savannah River Site near Aiken is the most radioactive Department of Energy site in the nation. The Barnwell nuclear dump is also a radioactive hot spot. Nowhere in the application does it discuss the cumulative impacts of having all these facilities operating in SC. Nor does it discuss the cumulative health impacts to Carolinians. The NRC must address these cumulative impacts to human health in the draft EIS. (**0010-3, 0049-11** [Barczak, Sara])

Comment: We have enough nuclear power plants and problems that go along with it, i.e. Barnwell Dumpsite, Savanah River Plant. (**0026-2** [Poole, Mary Jane])

Response: *Impacts of the normal operation of the two new reactors will be addressed in Chapter 5 of the EIS, and cumulative impacts addressed in the cumulative effects section of the EIS.*

Comment: Duke says substance found at the site contained radioactive tritium leaking into the groundwater from the Catawba nuclear power plant on Lake Wylie. Well, this is near my grandchildren. And one of the things I've learned with tritium -- I didn't know anything about it -- by the way, my grandchildren have well water. (**0001-66** [Arnason, Deb])

Comment: I wanted to see what tritium does to cancer. Tritium is commonly found in water molecules. New evidence of an association between increased cancers and proximity to nuclear facilities raises difficult questions. Should pregnant women and young children be advised to move away from them, should local residents check the safety of their gardens and crucially, should those around the world who are planning to build more reactors think again. (**0001-70** [Arnason, Deb])

Comment: Harmful radioactive pollution is released into the air and water from nuclear power plants on a routine basis. Also, highly toxic radioactive waste is stored on site in pools of water. "Children living near nuclear power plants suffer higher levels of birth defects, cancer and early death. A study of medical records found that **infant death rates near five U.S. nuclear plants increased within two years after the plants opened. The study also found that infant deaths decreased 15-20% soon after the reactors closed**. And the decreases in cancer and birth defects continued for 7 years after plant closure. (Environmental Epidemiology and Toxicology, 2002, Radiation and Public Health Project)" (**0035-2** [Hamrick, Mike])

Response: *The comments concern emissions of tritium and health effects that may result from such emissions. Emission estimates will be based on the approved AP1000 Design Control Document; these emission estimates are anticipated to be conservative. The NRC will evaluate human health and environmental impacts of the emissions in the EIS. Analysis results will be presented in Chapter 5 of the EIS.*

Comment: What kind of harm might we expect from a nuclear power plant in Cherokee County? One study compared cancer deaths before and after an operating plant in Burke County, Georgia. Cancers in all populations rose 24.2 percent in the county where the reactor began operating. Meanwhile, cancer rates statewide, all of Georgia, fell 1.4 percent. Can we say it came only from the nuclear reactor? Let's look at the radioactivity in the drinking water downstream from that Vogtle reactor. Between 1990 and 2003, an increase of 17 percent of beta radiation was detected by the Jasper water treatment plant, 112 miles downstream. Cesium 137 increased by 37 percent in that period after the Vogtle Nuclear Plant began operating. The Georgia Environmental Protection Division tested water, sediment, fish and found that indeed radiation was from two to 50 times above background levels -- two to 50 times above background levels. Is this from the bomb plant which is nearby? No. We have Savannah River Company separated out, the tritium, the radioactive water, from those two sources was tested and found 1900 curies going into the river in 2003, 1200 curies of radiation in 2004, 1860 curies of radiation in 2005. (**0001-30** [Zeller, Lou])

Comment: We have now from the University of South Carolina in Charleston, an analysis of 17 research papers covering 136 nuclear sites in the UK, Canada, France, the US, Germany, Japan and Spain, the incidence of leukemia in children under nine living close to the site showed an increase of 14 to 21 percent while it could be as high as 24 percent, depending on how close they were to the nuclear facility. Okay, this was followed by a German study of 14 cases of leukemia compared to the accepted four cases. And here's another one, this is in Germany, the results were published in the International Journal of Cancer. The main findings were a 60 percent increase in solid cancers and 117 percent increase in leukemia among young children living near all 16 large Germany nuclear facilities between 1980 and 2003. The closer they lived to the plant, the worse the health problems. Twice as likely to contract cancer as those living further away. (**0001-67** [Arnason, Deb])

Comment: Another example [of misleading information] is a cancer rate study that I keep hearing cited. It's been scientifically debunked and rejected by numerous state and federal review boards. But I keep hearing that cited. (**0001-84** [James, Andrew])

Comment: [R]ecent findings suggest that children living near nuclear reactor facilities face an increased risk of cancer A study of medical records found that infant death rates near five U.S. nuclear plants increased within two years after the plants opened. The study also found that infant deaths decreased 15 to 20 percent soon after the reactors closed. And decreases in cancer and birth defects continued for seven years after plant closure. Last year, researchers at the Medical University of South Carolina, already cited this evening, analyzed research regarding 136 nuclear sites in half a dozen states (sic) including the United States, and they reported leukemia incidences and deaths among children, depending on the closeness that they had to the nuclear facilities. Other studies found that children living closer to nuclear plants were more than twice as likely to contract cancer as those living further away, which has been confirmed by the German government. Critics of these studies again asserted that the radiation doses from nuclear power plants were too low to cause cancer, but other new data assert that there is no safe level of radiation, that infants and children are at greater risk than the standard man about whom safety standards have been calculated since the day the first bomb was dropped on Hiroshima.

Difficult questions come with this new evidence of a connection between increased cancers and proximity to nuclear facilities, such as how do you advise pregnant women and families with young children, and what do you advise people about the safety of crops grown in proximity to nuclear reactors? (**0001-141** [Patrie, Dr. Lew])

Comment: What about the health of my precious grandchildren? I understand there is a book out now that proves children are getting sick in the vicinity of nuclear plants, something in the title about radioactive materials in their baby teeth! (**0007-4** [Arnason, Deb])

Comment: Contrary to assertions about the safety of nuclear power and that no adverse health risks arise from people living in proximity to nuclear reactors, recent findings suggest that children living near nuclear facilities face an increased risk of cancer. Though a link had long been suspected, but never proved, that seems likely to change.

A study of medical records found that infant death rates near five U.S. nuclear plants increased within two years after the plants opened. The study also found that infant deaths decreased 15-20% soon after the reactors closed. And the decreases in cancer and birth defects continued for 7 years after plant closure. (Environmental Epidemiology and Toxicology, 2002, Radiation and Public Health Project). Last year researchers at the Medical Univ. of South Carolina analyzed research regarding 136 nuclear sites in the UK, Canada, France, Germany, Japan, Spain and the United States, reported increased leukemia incidences and deaths among children, depending on their closeness to the nuclear facilities (European Journal of Cancer Care, vol 16, p 355). Other-studies found that children living within 5 kilometers of the plants were more than twice as likely to contract cancer as those living further away, a finding that has been accepted by the German government. Critics of these studies again asserted that the radiation doses from nuclear power plants were too low to cause cancer, but other new data assert that there is no safe level of radiation, that infants and children are at greater risk than the standard man about whom safety standards have been calculated since the Hiroshima bomb.

Difficult questions come with this new evidence of a connection between increased cancers and proximity to nuclear facilities, such as how to advise pregnant women and families with young children, and the safety of crops grown in proximity to nuclear reactors. (**0015-4** [Patrie, Dr. Lew])

Response: *These comments refer to health impacts, which will be addressed in Chapters 4 and 5 of the EIS.*

D.1.2.12 Comments Concerning Accidents - Severe

Comment: There is a shocking NRC document called Report on Spent Fuel Accident Risk. According to the NRC, fire in a spent fuel pools at a reactor like Yankee which stores 488 metric tons of spent fuel would cause 25,000 fatalities over a distance of 500 miles if evacuation was 95 percent effective, but that evacuation rate would be almost impossible to achieve. (**0001-43** [Biggs, Diane])

Comment: Are you aware of the Sandia study NUREG-1738? (**0041-7** [Sutlock, Dot])

Comment: Are you aware of the claims that a spent fuel fire could produce 30,000 uninhabitable square miles which in this case would include Charlotte and the nearer smaller cities? Read [the article] What about the Spent Fuel? Bulletin of the Atomic Scientist Jan/Feb 2002. (**0041-8** [Sutlock, Dot])

Response: *These comments address large consequences of very low probability events at reactors being decommissioned. The NRC has adopted the use of mean risk estimates for the purposes of implementing its safety goal policy (51 FR 30028). Risk is the product of the event probability and consequences. When the consequences cited in the comments are multiplied by the probability of the events leading to the consequence, the average individual and population risks associated with the spent fuel pools are lower than the risks established in the safety goal policy. In fact, the first conclusion of NUREG-1738 (NRC 2001) is as follows: "The risk at decommissioning plants is low and well with[in] the Commission's safety goals. The risk is low because of the very low likelihood of a zirconium fire even though the consequences from a zirconium fire could be serious." Designs of spent fuel pools for new reactors have benefitted from risk analyses of spent fuel pools for existing reactors. Thus, the staff expects that the risks associated with spent fuel pools for new reactors will be lower than those associated with spent fuel pools at reactors undergoing decommissioning.*

Comment: Are you aware that the Sandia CRAC-2 study projects 42,000 early fatalities from an accident at Catawba and 26,000 cancer deaths from an accident at McGuire? (**0041-9** [Sutlock, Dot])

Response: *The potential consequence of a severe accident can be large. However, not all severe accidents lead to large consequences, and the probability of a severe accident is* *extremely low. As a result, risk, which is the product of probability times consequence, is the measure used to evaluate impacts of severe accidents. Risk and environmental impacts of postulated accidents at the Lee site will be assessed, and analysis results will be presented in Chapter 5 of the EIS.*

D.1.2.13 Comments Concerning the Uranium Fuel Cycle

Comment: Another part of this equation is the fact that we have no place to put nuclear waste. We have the hubris to believe that as humans we can tell future generations for 120,000 years that this waste that we put on their shoulders is a responsible act. It's not a responsible act. Nevada is refusing to take nuclear waste, most South Carolinians, when they find out about what's going on down in Aiken with the nuclear waste repository planned there, do not want to see this. (**0001-35** [Cherin, Mike])

Comment: What are you going to do with nuclear waste. (**0001-108** [Moss, Charles])

Comment: [T]he environmental impact statement should look at the complete nuclear fuel cycle and impacts all along the chain. (**0001-133** [Clements, Tom])

Comment: [L]ow level nuclear waste is produced all the time -- there is no place that high level nuclear waste, spent fuel rods that are taken out of the reactors, is going at the current time. The Yucca Mountain facility -- and I want to make this clear to everybody -- construction has stopped. And what might those alternatives to Yucca Mountain be? [Senator Pete Domenici] is talking about creating interim storage sites, one in the east and one in the west or the reprocessing of spent fuel which, as was also pointed out, if that program goes forth, a huge amount of spent fuel would go to wherever the reprocessing site would be. And unfortunately the Savannah River Site is a prime candidate for that in the United States.

So what does that mean for the Lee site? And this has to be analyzed in the environmental impact statement. There is likely no place that that spent fuel is going to go. So we may well be looking at the de facto high level waste dump on the banks of the Broad River. (**0001-134** [Clements, Tom])

Comment: I think the spent fuel should be a show stopper. There's no place for it to go, there's nothing to do with it. (**0001-135** [Clements, Tom])

Comment: I'm concerned about the production of the nuclear reactors from the uranium mining right through the time we're dealing with nuclear waste, which are very high level kinds of waste, and the health effects generated from them. (**0001-138** [Patrie, Dr. Lew])

Comment: I would urge the NRC to maybe start looking inside themselves, maybe start looking at their hearts and start realizing that we're really messing with something here that is mostly interfered by with something that I call WMD, which is waste management denial. (**0001-180** [Sorensen, Ole])

Comment: [H]ow does it affect the next generation when we have nowhere to put the waste. (**0001-186** [Sorensen, Laura])

Comment: It doesn't take just five years for this to be decontaminated once it's buried. It takes 10,000 years. (**0001-187** [Sorensen, Laura])

Comment: Duke has no place to put the spent fuel rods that they use except in huge pools within the Catawba plant itself, as well as McGuire and Oconee plants. Nor is there any repository or any hope for one, it looks at this point, for the rods that will be produced in the future. What are we going to do with these rods that are now stored on these plants? Even the low level waste may have no place to go if the low level dump at Barnwell closes. (**0001-191** [Connolly, Mary Ellen])

Comment: The NRC needs to look at the environmental impact of the entire nuclear generated fuel cycle, from the uranium mining to the post production of nuclear energy. The environmental impact on areas of our southwest, particularly on Native American lands, has been devastating. Health risks associated with uranium mining should also be considered. (**0005-1** [Craig, Anne])

Comment: I am concerned that there is no present solution for safe storage of the radioactive waste. It seems ludicrous to pour billions of dollars into building power plants whose life span is 25-30 years, leaving our children and grandchildren with lethal waste for thousands of years. There are safer and better ways to meet our energy needs. (**0005-5** [Craig, Anne])

Comment: Where will the waste that remains hazardous for thousands of years be stored? (**0007-6** [Arnason, Deb])

Comment: No one agency has yet solved the problem of safe disposal of nuclear waste, or spent nuclear fuel. Better not to create waste in the first instance. (**0034-6** [Karpen, Leah R.])

Comment: Where will the waste go? (**0041-2** [Sutlock, Dot])

Response: *The impact of the uranium fuel cycle, including disposal of low-level radioactive waste and spent fuel, will be addressed in Chapter 6 of the EIS. The generic impacts of the fuel cycle are codified in 10 CFR 51.51(b), Table S–3, "Table of Uranium Fuel Cycle Environmental Data." Per the guidance in 10 CFR 51.51 and Section 5.7 of NUREG-1555 (NRC 2000), the staff will rely on Table S–3 as a basis for uranium fuel-cycle impacts.*

The safety and environmental effects of long-term storage of spent fuel on site has been evaluated by the NRC and, as set forth in the Waste Confidence Rule at 10 CFR 51.23, the NRC generically determined that "if necessary, spent fuel generated in any reactor can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor at its spent fuel storage basin or at either onsite of offsite independent spent fuel installations. Further, the Commission believes there is reasonable assurance that at least one mined geologic repository will be available within the first quarter of the twenty-first century and sufficient repository capacity will be available within 30 years beyond the licensed life for operation of any reactor to dispose of the commercial high-level waste and spent fuel originating in any such reactor and generated up to that time."

Comment: In January, Russia and the U.S. Commerce Secretary signed a trade agreement. This allowed Russia to incrementally boost enriched uranium exports to the U.S. The deal allows the sale of Russian enriched uranium directly to U.S. utilities. By 2014, one in five American nuclear plants will be running on Russian uranium. According to the U.S. Nuclear Energy Institute, the American market will have a uranium shortage beginning in 2011. I would like maybe us to start to think about the future and what's happened to us with oil. Everyone is complaining that we need to be sustainable at home, we need to not be dependent on oil. And yet what we're setting our future for with uranium imports from Russia and other countries, Australia and Kazakhstan, we're going to be dependent on uranium imports.
(**0001-181** [Sorensen, Laura])

Comment: I am coming with a very simple message and that is that there is no reasonable likelihood that when these nuclear reactors are built there will be fuel supply to run them. It's not the case, as was just suggested, that demand exceeded supply recently. That happened back in 1990. Since then, the shortfall has been made up by the supplies from Russians. The International Atomic Energy Association projection puts the Russian source of uranium running out in 2014, the enrichment uranium running out in 2011 and the stockpiled uranium running out -- guess when -- 2008. If this is the case, why are we building new ones? I suggest that in this part of the study, you look very carefully at the supply question, globally.
(**0001-188** [Sticpewich, John])

Comment: I tend to wonder why where uranium production is such a question, we're talking about new reactors. And until then, I suggest we should stop wasting the taxpayers' money talking about things that really can't happen. (**0001-189** [Sticpewich, John])

Response: *The irretrievable and irreversible commitment of resources, such as uranium, will be addressed in the context of the resources' availability in Chapter 11 of the EIS.*

Comment: Back from the '50s to the '70s, a lot of people were killed because of uranium poisoning. They were open pit mining. The United States ended up giving the Native

Americans compensation for the medical bills for cancer. This is a proven fact, uranium mining equals cancer. (**0001-183** [Sorensen, Laura])

Comment: [R]ight now uranium has more than tripled in price, so the government is going back now and these mining companies are going and saying we're coming back and we have this new technology. It's also called uranium leaching, it's leach mining. And what they do is they inject chemicals into the ground and that leaches up off the rock, the uranium. So they did studies of course and told these Native Americans in New Mexico and the four corner states of the west that this was okay, this is safe, this is brand new technology. Well, the Native Americans, after they've lost their families to cancer, are saying no way. We're going to have other experts come in and do a study and see how safe this is. So two other companies came in and they said, listen, if they do this, within seven years, you water supply will be destroyed. (**0001-184** [Sorensen, Laura])

Comment: So I think I am asking you all to think globally when there's an issue like this. It's not just about us right here. I hope that you can think about the [Native Americans] and think about this whole process of not just flipping your switch or having this right here in your area. How does it affect the rest of the world, how does it affect Native Americans and their children? (**0001-185** [Sorensen, Laura])

Response: *The impact of the uranium fuel cycle will be addressed in Chapter 6 of the EIS. The generic impacts of the fuel cycle are codified in 10 CFR 51.51(b), Table S–3, "Table of Uranium Fuel Cycle Environmental Data." Per the guidance in 10 CFR 51.51 and Section 5.7 of NUREG-1555 (NRC 2000), the staff will rely on Table S–3 as a basis for uranium fuel-cycle impacts.*

D.1.2.14 Comments Concerning Transportation

Comment: Let's talk about nuclear waste and let's talk about the accidents that are going to happen with nuclear waste -- not if, but when. The more nuclear waste and the more nuclear products that are transported throughout this country, we're going to have trucks going off the road, spilling nuclear waste. (**0001-34** [Cherin, Mike])

Comment: I am concerned about the transport of high level radioactive materials over our roads and rails, the likelihood of accident and the lack of adequate emergency response (**0005-4** [Craig, Anne])

Response: *The health and safety impacts of transporting fuel and waste by truck to and from the proposed Lee site will be addressed in Chapter 6 of the EIS.*

Comment: And I see truncation under NEPA, particularly because there is clear evidence that one of the requirements for these projects to go forward is at least the appearance of a solution

to the nuclear waste problem, which would involve moving the nuclear waste, which would most likely involve moving the nuclear waste somewhere into South Carolina, either Barnwell or Savannah River Site. That's conjecture -- it is -- but there's these federal EIS's about to come out on it. So how and why do these all fit together and in what way is the public, and more importantly, our environment, served by these separate, broken up, scatter-shot analyses that will result in nobody looking at the impact of tens of thousands of shipments of high level nuclear waste traveling through downtown Charlotte, around the beltway of Columbia, potentially across the bridge in downtown Asheville, definitely through the heart of Atlanta, definitely through the heart of Augusta. And where is that going to be looked at?
(**0001-57** [Olson, Mary])

Comment: You're going to tell me that that [transporting nuclear waste from multiple power plants] through the Carolinas doesn't fit in this EIS. Well, you tell me which EIS it fits in.
(**0001-58** [Olson, Mary])

Response: *The health and safety impacts of transporting fuel and waste to and from the proposed Lee site will be addressed in Chapter 6 of the EIS. The transportation of nuclear waste and fuel to and from other reactors is outside the scope of this review.*

Comment: Disposal of hazardous waste material from the Lee site must be carefully reviewed. Potential hazards during waste removal and transport to an appropriate facility must be documented in the EIS. (**0045-13** [Hall, Timothy N.])

Response: *The impacts from the generation, handling, and disposal of hazardous waste material from the operation of the Lee site will be addressed in Chapter 5 of the EIS.*

Comment: [W]e have a traffic advisory committee, which includes local residents, evaluating potential traffic impacts to the community during construction and operation, and we are working with neighbors and businesses regarding transmission and railroad right of ways.
(**0012-3** [Dolan, Bryan])

Response: *Environmental impacts associated with any planned new transmission lines and additional railroad rights-of-way will be addressed in the context of cumulative effects, as well as potential impacts associated with upgrades to the existing lines. The nonradiological impacts of transporting construction materials and workers will be addressed in the EIS.*

D.1.2.15 Comments Concerning Cumulative Impacts

Comment: I don't think it is fair to have two here. The adverse impact on one is enough for taxpayers to deal with, what with the, increased cancer incidents in Oconee.
(**0004-1** [Kohler, Elizabeth])

Comment: Construction of the Lee site, or any of the other alternatives considered, may foster or accelerate increased development of the surrounding areas. The EIS should model potential changes including, but not limited to, demographics, population growth, traffic needs, and spread of invasive and exotic species. Particular attention should be given to the effected riverine and natural wetland and floodplain systems. We are concerned that the water intake from the Broad River could disrupt the ecological balance within the system. How will the water intake affect the drinking water supplies and assimilative capacity of the Broad River? (**0045-11** [Hall, Timothy N.])

Response: *The direct and indirect impacts associated with the construction and operation of the proposed Lee site will be evaluated in Chapters 4 and 5 of the EIS. The impacts from multiple nuclear units will be discussed in the cumulative section of the EIS to the extent the staff has determined it is appropriate.*

D.1.2.16 Comments Concerning the Need for Power

Comment: As a high growth state, South Carolina needs additional safe and reliable sources of baseload electric generation. (**0001-1** [Moss, Dennis Carroll])

Comment: In the Carolinas, Duke Energy adds approximately 40,000 to 60,000 customers each year. As a regulated utility, it's our obligation to serve that growth in electric demand. Each year, Duke Energy uses an integrated planning approach to ensure it can reliably and economically meet the electric needs of our customers well into the future. The planning process takes into consideration many factors, including projected electricity use, existing generation, generation supply contracts, demand-side management, energy efficiency and potential new sources of generation such as renewable resources, coal, natural gas and nuclear. Duke's planning process tells us that among other options such as renewables, coal and natural gas, it is prudent to maintain new nuclear as an option for our customers going forward. Although we have not yet made a decision to build a new nuclear plant, if we are to maintain nuclear as an option for our customers in the latter part of the next decade, it is important that we prudently plan for this option now. (**0001-12** [Dolan, Bryan])

Comment: I also come today to applaud the company's efforts to anticipate growing needs and plan now for what we need in the future. We need safe, reliable electricity for my family and customers across the Carolinas. (**0001-74** [Blue, Lilly])

Comment: Demand across South Carolina is growing and recently a group of utility executives met ... [and] were talking about if we didn't make the decisions right now to build these plants within the next 10 to 12 years, that we could expect, particularly in the southeast -- and this was the phrase that they used -- sustainable and uncontrolled blackouts. So demand is growing. We need additional capacity. There are really no reasonable alternatives to new nuclear plant construction. Without new capacity, our factories risk shutdowns or closure (**0001-92** [Gossett, Lewis])

Comment: As our area continues to grow, the need for additional safe, reliable and affordable electric generation will increase greatly. This facility will provide that additional needed baseload capacity while also reducing greenhouse emissions. (**0001-113** [Forrester, Mike])

Comment: South Carolina needs additional safe, reliable, base-load electric generation, which does not emit greenhouse gases to serve our growing needs (Duke Energy alone is adding 40,000 - 60,000 new customers each year). Electric generation from renewable energy is important. However, these resources cannot provide the sustained capacity that base load generators, like nuclear, can provide 24-hours a day (**0018-2** [Sandifer, Bill])

Comment: U.S. Department of Energy estimates that our electricity demand will increase 25 percent by 2030. It's easy to see why. As technology advances, our economy expands, and our population increases, so too will our need for energy grow. We have so many devices that require electricity to recharge-such as laptops, cell phones, and iPods. And in the not too distant future we may be driving cars powered by fuel cells that will also be plugged in for recharging. (**0029-2** [Houston, Kate])

Comment: The two proposed nuclear generators at the Lee Nuclear Station would supply energy to about 2 million homes, with a capacity of 2,234 megawatts. Duke Energy now serves 2.3 million customers in both North and South Carolina. The company adds about 50,000 new customers each year to its services in both states, and expects to increase output by 10,700 megawatts by 2027 in order to meet demand.

South Carolina has witnessed phenomenal growth in the past few years. In 2007, our state was the 10th fastest growing state in the nation, according to the U.S. Census Bureau. Estimates show this trend continuing in the decades ahead and more sources of power will be needed to accommodate this demand. (**0030-2** [Taylor, Joe])

Response: *Affected states or regions may prepare a need for power evaluation and an assessment of the regional power system for planning or regulatory purposes. A need for power analysis may also be prepared by a regulated utility company and submitted to a regulatory authority such as a state Public Utilities Commission (PUC), who has regulatory authority over the Certificate of Public Necessity and Convenience, as well as rates and rate recovery. However, the data may be supplemented by information from other sources as required. The determination for the need for power is not under NRC's regulatory purview. When another agency has the regulatory authority over an issue, NRC defers to that agency's decision. The NRC staff will review the need for power and determine if it is (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting* *uncertainty. If the need for power evaluation is found to be acceptable, no additional independent NRC review is needed. The need for power will be addressed in Chapter 8 of the EIS.*

Comment: The NRC also needs to fully evaluate Duke's need for power along with alternative supply options, including energy efficiency and demand-side management measures. We are concerned that Duke is over-estimating capacity needs and that the NRC needs to fully evaluate whether the additional generating capacity is truly needed. The high cost of nuclear power plants will likely result in cost overruns and rate increases and this is not mentioned in the application. (**0001-15** [Barczak, Sara])

Comment: The other part of this too is the Cliffside, the coal burning power plant that Duke is working so hard to complete right now, is only 35 miles away from where we are here. How can they justify that the power needs for this region need an 880 megahertz coal burning power plant and two nuclear reactors? It's ridiculous. Even Duke admits that we don't need new power plants until 2020. We can do the smart thing with alternative energy, provide jobs and keep the health of this region intact. (**0001-37** [Cherin, Mike])

Comment: A major reason that we're discussing new generation nuclear plants is the need for new baseload electric generation. The DOE projects a drastic growth in energy demand and the southeast is arguably the fastest growing region in the United States. Certainly conservation and efficiency are the lowest hanging fruit and must be pursued vigorously. (**0001-81** [James, Andrew])

Comment: The U.S. Census Bureau projects that by 2030, North and South Carolina will increase in population by 52 and 28 percent respectively. Energy conservation is and will continue to be an important contributor in alleviating increase in energy demand due to the growing population. However, I would caution that the environmental impact statement provide realistic and achievable estimates as to how much energy savings can be realized without decreasing our overall standards of living. (**0001-124** [Chisolm, Sarah])

Comment: NRC needs to fully evaluate Duke's need for power along with alternative supply options, including energy efficiency and demand side management measures. We are concerned that Duke is overestimating capacity needs and the NRC needs to fully evaluate whether the additional generating capacity is truly needed. The NRC needs to include all of Duke's new power plant proposals, such as the new coal unit proposed for the Cliffside plant in NC. (**0009-4, 0049-4** [Barczak, Sara])

Comment: In the Carolinas, Duke Energy has been adding approximately 40,000-60,000 customers each year. As a regulated utility, Duke Energy has an obligation to serve this growth in demand for electricity. Each year, Duke Energy Carolinas uses an integrated planning approach to ensure it can reliably and economically meet the electric energy needs of our customers well into the future. The planning process takes into consideration many factors, including projected electricity use, existing generation, generation supply contracts, demand-side management, energy efficiency initiatives, and potential new sources of generation such as renewable resources, coal, natural gas and nuclear. (**0012-2** [Dolan, Bryan])

Comment: If energy efficiency is delivered to Duke customers to reduce consumption across the service area by 30%, would this new power plant be needed? How many other generation sources could be scrapped? (**0038-5** [Turk, Lawrence "Butch"])

Response: *Affected states or regions may prepare a need for power evaluation and assessment of the regional power system for planning or regulatory purposes. In North and South Carolina, the need for power analysis may also be prepared by a regulated utility company and submitted to a regulatory authority, such as a state PUC. This analysis by the regulated utility company, called the Integrated Resource Plan (IRP), contains details on energy efficiency, demand side management, and peak-power reduction strategies, all of which are considered conservation activities. These data may be supplemented by information from other sources as required. The state PUC also has regulatory authority over issuance of the Certificate of Public Necessity and Convenience, as well as rates and rate recovery regarding the construction and operation of new power plants. Duke submitted the IRP to both North and South Carolina in 2007 and accounted for the Cliffside Station in out-year capacity and margin projections. The determination for the need for power is not under NRC's regulatory purview. When another agency has the regulatory authority over an issue, the NRC defers to that agency's decision. The NRC staff will review the need for power and determine if it is (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainty. If the need for power evaluation is found to be acceptable, no additional independent NRC review is needed. Alternative energy supply options will be further evaluated and addressed in Chapter 9 of the EIS. The information provided in these comments will be considered to determine whether it significantly affects the forecast upon which the applicant relied for its need for power analysis.*

Comment: This electric generation facility will contribute significantly to meeting the growing energy needs in South Carolina. At the same time, it is believed nuclear energy has a small carbon footprint and contributes to the United States quest to reduce carbon emissions and other air pollutants. (**0024-1** [Batchler, James D.] [Foster, Rufus H.] [Humphries, H. Baily] [Little, Quay] [Mathis, Charles] [Parris, Hoke] [Spencer, Tim])

Response: *The need for power based on population growth and electrical demand in the Carolinas will be analyzed and addressed in Chapter 8 of the EIS. Alternative energy sources will be reviewed and addressed in Chapter 9. Relative impacts on the environment, including air quality impacts from plant emissions (e.g., criteria pollutants and greenhouse gasses), will be* *evaluated and compared with alternative energy sources. Both North and South Carolina participate in Federal, State, and regional programs designed to mitigate and reduce emissions.*

D.1.2.17 Comments Concerning Alternatives - Energy

Comment: And cloudy Germany is now switching to solar energy. They've found ways to do that, and I'd like to see the Carolinas do that. (**0001-68** [Arnason, Deb])

Comment: An engineer on [an educational TV] program, he went on to say if we would go to the desert in Nevada where the government owns millions of acres and we were to take 100,000 acres of that desert and cover it in solar panels, that that alone would meet the energy of the United States currently and into the next 10 or 20 years. We could manufacture the panels here. Now my question is -- now this was on PBS -- why don't we do that? It's clean (**0001-107** [Moss, Charles])

Comment: [I] understand cloudy Germany is now using solar energy. (**0008-1** [Arnason, Deb])

Response: *Alternative energy sources, including solar, will be evaluated and addressed in Chapter 9 of the EIS.*

Comment: [W]e know that wind, solar and particularly bio are just not reasonable alternatives for us in terms of meeting our capacity. Sure you can power one plant here and there and maybe a neighborhood, but you can't meet the needs that we're going to have. And in fact, biofuel, we are certainly learning at this time, may in fact be one of the most detrimental things to our environment we've seen in a long time. (**0001-96** [Gossett, Lewis])

Comment: I strongly urge the regulators to consider the consequences of not employing the proposed action. It is estimated that the nation's demand for electricity will increase by nearly 50 percent by 2030. Without an increase in baseload nuclear generation, I believe the EIS would conclude that the only realistic alternatives would be those which would emit substantial quantities of carbon dioxide. Nuclear power, while not part of the group, ranks among the lowest life cycle emitters in bulk power generation. (**0001-149** [Murphy, William])

Response: *These comments generally express support for the proposed nuclear power plant as a baseload source of power in Duke's region of interest but do not provide specific information related to environmental impacts of the proposed project. Alternative energy sources (including renewables such as wind, solar, and biomass) and the no-action alternative will be evaluated in terms of the proposed project in Chapter 9 of the EIS.*

Comment: I stand here against this thing because, number one, it's unnecessary. There are other ways to generate electricity besides nuclear. (**0001-103** [Moss, Charles])

Response: *The EIS will be prepared in accordance with 10 CFR 51.75(c). Alternative energy sources, including renewable energy sources (as well as energy conservation and efficiency programs) and the no-action alternative will be addressed in Chapter 9 of the EIS and will be assessed against the proposed project. Energy conservation will also be considered as part of the need for power analysis in the EIS.*

Comment: [O]ur nation and our planet faces a crisis of rapidly expanding proportions with respect to global warming, increasing acidity of our oceans due to absorption of carbon dioxide, air pollution and its horrendous health effects, and dependency on unstable regions of the world for most of our energy needs. (**0001-159** [Wolfe, Clinton])

Response: *The NRC is not involved in establishing energy policy; rather, it regulates the nuclear industry to protect public health and safety within existing policy. The discussion of alternative energy sources in Chapter 9 of the EIS will describe potential impacts from alternative energy sources, including fossil and renewable energy sources such as wind and solar, in comparison with the proposed action. Nuclear power plants do not burn fossil fuels and therefore do not generate or emit criteria pollutants or greenhouse gases.*

Comment: The [Lee] application does not adequately address these other energy options. Renewable energy technologies, which are not likely to be targeted by terrorists nor have the capacity, in terms of accidents, to kill thousands of people or permanently contaminate large land areas, should not be ignored by Duke. Energy efficiency measures also pose no health or safety risks to the public and Duke has significant resources to tap in this arena. Duke has excellent wind resources within its service area and should invest more in developing this clean, safe energy resource instead of spending billions of dollars on the proposed Lee site. There is also potential for bioenergy production in their service territory. Clean forms of bioenergy represent a home-grown energy source that can provide local jobs to rural areas and also support farmers and the region's economy while helping expand clean energy technologies. The use of solar and other clean energy choices were summarily dismissed in the application. The draft EIS must include a more thorough analysis. (**0001-14** [Barczak, Sara])

Comment: Nuclear energy appears to be riskier than some of the other alternatives that have been presented here tonight. (**0001-144** [Patrie, Dr. Lew])

Comment: Solar does not represent this [tritium dose] hazard, or many others. (**0008-2** [Arnason, Deb])

Comment: [T]he Lee application does not adequately address these other energy options. Renewable energy technologies, like bioenergy, solar, and wind, which are not likely to be targeted by terrorists nor have the capacity, in terms of accidents, to kill thousands of people or permanently contaminate large land areas, should not be ignored by Duke. Energy efficiency measures also pose no health or safety risks to the public and Duke has significant resources to tap in this arena. (**0009-2, 0049-2** [Barczak, Sara])

Comment: Duke has excellent wind resources within its service area and should be encouraged to invest more in developing this clean, safe energy resource instead of spending billions of dollars on the proposed Lee site. There is also potential for bioenergy production in their service territory. Clean forms of bioenergy represent a 'homegrown' energy source that can provide local jobs to rural areas that would also support farmers and the region's economy, while helping expand clean energy technologies. The use of solar technologies and other clean energy choices were summarily dismissed in the application. The draft EIS must include a more thorough analysis of energy alternatives. (**0009-3** [Barczak, Sara])

Comment: Duke has excellent wind resources within its service area and should be encouraged to invest more in developing this clean, safe energy resource instead of spending billions of dollars on the proposed Lee site. There is also potential for bioenergy production in their service territory. Clean forms of bioenergy represent a 'homegrown' energy source that can provide local jobs to rural areas that would also support farmers and the region's economy, while helping expand clean energy technologies. The use of solar technologies and other clean energy choices were summarily dismissed in the application energy alternatives.
(**0049-3** [Barczak, Sara])

Response: *The NRC is not involved in establishing energy policy; rather, it regulates the nuclear industry to protect public health and safety within existing policy. The discussion of alternative energy sources, including wind, solar, and biomass, will be addressed in Chapter 9 of the EIS, which will compare and describe potential environmental impacts from alternative energy sources. Energy risk evaluation is not within the scope of the EIS in accordance with NEPA requirements. As part of the COL process and in conjunction with the EIS, the NRC staff will conduct a safety review detailing site-specific safety analysis and design specific analysis.*

Comment: We have, as scientists claim, ten years -- ten years -- to change our ways. And these new nuclear reactors won't come on line in time to fix the problem. South Carolina is the third least efficient state in the country when it comes to energy consumption. We need to start implementing energy efficiency. We could start using renewables. I hear that wind doesn't have maybe the most promising future in South Carolina but we're also the 13th sunniest state in the country and the sun isn't unreliable. So it hurts me to stand here in South Carolina and know that there's so many new proposed nuclear reactors because this state has so much potential. We have innovation, technology and potential on our side. I just ask you to take that into consideration in the environmental impact statement. (**0001-119** [Tansey, Sara])

Comment: [I]f we can improve the structure of our buildings to reduce their consumption by 50 percent, that's just another way we're going to save energy and we really don't need any more nuclear plants. (**0001-156** [Saye, Jack])

Comment: [Dependence on foreign uranium] doesn't seem very promising when we have so many resources here with wind. (**0001-182** [Sorensen, Laura])

Comment: You want to do something, then build a few windmills. They will provide free clean energy and will also employ people to build them. We have plenty of places to install them and the benefits of windmills would greatly outweigh those of another power plant. (**0004-2** [Kohler, Elizabeth])

Comment: I would like to stress the more commonsensical arguments against such an unsafe, expensive and environmentally unsound method of producing energy. First of all, why don't we emphasize our country going on an energy diet? Before we consider new sources of megawatts, we should consider cultivating negawatts. We need to first of all clean up all the slop in the system before we search for new energy sources of any kind but especially those that are basically unsafe and expensive. (**0006-2** [Craig, Thomas])

Comment: Please insist that Duke Energy check out all sorts of renewable energy options at www.renewableenergyworld.com. A free subscription is available at www.rew-subscribe.com. We want to know how much wind energy capacity exists within the Duke service area? What is the solar capacity of all rooftops within the Duke service area? (**0007-13** [Arnason, Deb])

Comment: The most rapid and inexpensive method of dealing with shortage of electrical energy is through energy efficiency, which would be feasible if citizens' groups, industry, financial interests and government would immediately and vigorously and begin action as if our way of life depended upon it.

Truly renewable energy source should likewise be pursued. Wind power is already less costly than nuclear power, and the cost of solar energy is somewhat more expensive-today but costs are coming down rapidly. Nuclear power plants may become economically obsolete before new ones could be brought on line. Solar and wind power do not need water, which we all know is an important issue in the southeastern U.S. The notion that renewable energy cannot supply the electricity requirements of the United States has been widely put forward without careful technical evaluation. Several sources suggest just the opposite. Nuclear energy appears to be the riskier course. (**0015-6** [Patrie, Dr. Lew])

Comment: Could Duke energy instead promote solar capacity and/or supply wind energy? Are there other sources of power possible? (**0034-4** [Karpen, Leah R.])

Comment: I would like to see everyone convert to wind or solar power sources. The government should give power company's tax breaks for converting over to wind or solar power. (**0036-2** [Thomas, Amber])

Comment: As a prospective downwinder, I am horrified by this scheme. Nuclear energy is not the solution to the climate crisis -- it takes too long, costs too much and still has enormous health, safety and security challenges -- and therefore is an enormous distraction from the REAL solutions of massive, systemic, delivered and installed energy efficiency and really clean power from the natural forces of wind, sun and the appropriate harnessing of water power. (**0038-1** [Turk, Lawrence "Butch"])

Comment: How much wind energy capacity exists within the Duke service area? What is the solar capacity of all the roof tops within the Duke Service area? (**0038-4** [Turk, Lawrence "Butch"])

Comment: Why take any risk or make any assumptions when there are so many green options for reducing energy consumption. Americans have become energy hogs. We need to take responsibility and not throw everything onto future generations to deal with. (**0039-2** [Hedges, Jean])

Comment: Support green technology. It may be different in every area: geothermal one place, solar another, windmills, or a combination. Short run costs=long term savings and safety. Instead of having taxpayers fund billions for unsafe technology give them direct incentives to use all of the thousands of safe alternatives that are readily available. (**0039-4** [Hedges, Jean])

Comment: Are you aware that Americans use 340 million BTU per person per year and Europeans use less than 150 million BTU per person per year? Efficiency improvements would eliminate the need for new power plants entirely. Are you aware of the recent developments in geothermal electricity, wave energy, wind, off-shore wind, micro-wind, PV, building integrated PV, solar thermal, concentrated PV, Stirling dishes, fuel cells, algae, ...? (**0041-6** [Sutlock, Dot])

Response: *The NRC does not establish public policy regarding electric power supply or energy-consuming alternatives, nor does the NRC promote the use of nuclear power as a preferred energy alternative. In addition, the NRC does not regulate alternatives or activities to producing electricity that do not involve nuclear power. The NRC does evaluate energy alternatives (including conservation) as part of its review of applications for new nuclear power plants in accordance with NEPA requirements. The comparative review of energy alternatives such as wind, solar, biomass, and geothermal alternatives and their associated environmental impacts will be addressed in Chapter 9 of the EIS.*

D.1.2.18 Comments Concerning Alternatives - System Design

Comment: 2.2.1.2 The Vicinity, page 2.2-4. The proposed height of the reactor domes (185.5 ft above ground level) will be visible from Kings Mountain State Park, Croft State Park and Crowder's Mountain State Park, and from the downstream reach of the Broad River designated as a State Scenic River. Cooling towers are planned to be *shorter and compact*, but may still be tall (> 90 ft) relative to the local area. These construction features represent a visual impact to the view shed including important recreational, scenic and natural conservation areas. (**0046-1** [Perry, Robert D.])

Response: *Aesthetic impacts of the cooling towers will be addressed in Chapter 5 of the EIS.*

D.1.2.19 Comments Concerning Alternatives - Sites

Comment: Regarding the National Environmental Policy Act, I would add this for the Nuclear Regulatory Commission staff, the Environmental Policy Act requires a comparison of alternative sites for nuclear power reactors as well as others. Within the NRC's own records, LBP079, Judge Carlin in the Atomic Safety Licensing Board, wrote how and where NRC staff utterly failed to properly do what the law requires. It is up to the Nuclear Regulatory Commission staff to do the job to protect public health and safety, not to simply ditto what industry hands to them on the platter. (**0001-32** [Zeller, Lou])

Response: *The Council on Environmental Quality advises that when there are potentially a very large number of alternatives, only a reasonable number of examples covering the full spectrum of alternatives must be analyzed and compared in an EIS (46 FR 18027). The NRC staff will review the alternative site-selection process to determine if it is systematic, employs reasonable selection criteria, and constitutes an acceptable number of reasonable sites for consideration. The process must enable the applicant and reviewers to evaluate and select proposed and alternate sites based on environmental preference and obvious superiority. The process and results will be provided in Chapter 9 of the EIS.*

Comment: The three alternate sites to be evaluated in the EIS (Anderson and Oconee Counties, SC, and Davie County, NC) should also present a similarly extensive review of impacts to protected species. The [U.S. Fish and Wildlife] Service has previously submitted a list of T&E for the South Carolina counties to be considered in the EIS. (**0045-6** [Hall, Timothy N.])

Response: *The NRC will enter into informal consultation with the FWS to obtain the most recent information on Federally listed species in counties affected by the project. A reconnaissance-level description and evaluation of potential impacts to Federal and State-listed species at the three alternative sites will be provided in Chapter 9 of the EIS. The NRC's NUREG-1555 (NRC 2000) specifies a reconnaissance level of information and analysis for alternative sites, whereas a more in-depth level of information and analysis of potential impacts to protected species are required for the proposed Lee site.*

D.1.2.20 Comments Concerning Benefit-Cost Balance

Comment: [T]he question that you have to ask yourself is you don't like nuclear, why would they build nuclear. Why? Well, if they build renewable energy generation exclusively or mostly, the price of power would go up dramatically. You take people that can't afford food right now, they can't afford their energy right now. Cost is a big concern to a lot of people and to, you know, in a short-term manner, raise the price of power by 50 percent, 100 percent because it's important to build renewable as quick as possible, that's just not do-able for a lot of people. (**0001-102** [Stone, Bryan])

Response: *The benefit-cost balance for the project will rely on the best available estimate of project timing and duration, with uncertainties noted. Chapter 11 of the EIS will discuss the estimated overall costs and environmental impacts of the proposed project. The discussion of alternative energy sources in Chapter 9 of the EIS will describe potential impacts from these sources in comparison with the proposed action.*

Comment: The EIS scope should also include the impact on public well-being resulting from the risk of money being taken from the public in the form of taxes with loan guarantees being paid out to Duke investors and people who are loaning. (**0001-201** [Rudolf, Jerry])

Comment: Why should you allow taxpayer dollars to subsidize an obsolete technology? Why should taxpayer dollars subsidize obsolete and dangerous nuclear reactors when they are so unnecessary? (**0041-4** [Sutlock, Dot])

Response: *The NRC is not involved in establishing energy policy; rather, it regulates the nuclear industry to protect public health and safety within existing policy. Issues related to the subsidization of nuclear power are outside the scope of the NRC's mission and authority and will not be addressed in the EIS.*

Comment: And how does it [nuclear power] stack with the price of fuel going up and up and up while other technologies like solar are coming down and down and down in price. (**0001-55** [Olson, Mary])

Comment: Nuclear is largely scalable, very low emission, reliable in all weather types and most importantly, safe. With respect to the environment, it also has the smallest geographic footprint when stated on a kilowatt-hour basis than most other forms of generation, including renewables. (**0001-82** [James, Andrew])

Comment: We understand and we know that the facts that you've heard about the cost of the generation of nuclear power being low are accurate. And quite frankly, I haven't seen any evidence to indicate that these other alternative sources are getting that much cheaper and they're actually realistic in South Carolina, particularly wind. (**0001-94** [Gossett, Lewis])

Comment: I stand here against this thing because there are other ways to generate electricity besides nuclear. And the astronomical expense of this thing. (**0001-104** [Moss, Charles])

Comment: How much would each option cost compared to the proposed nuke? What are the true costs of nuclear reactor operation - including all the costs born by we taxpayers including direct subsidies, tax credits, loan guarantees, federal waste program, federal insurance program and costs born by victims including health impacts from routine release of radioactivity, miming [mining], processing nuclear fuel, waste transport, management, treatment (including incineration and heat treatment) and disposal? (**0038-6** [Turk, Lawrence "Butch"])

Comment: At least a quarter of the country is in the Sunbelt. Once upon a time we gave tax incentives to folks who installed solar panels. It is absurd that we would rather spend billions on new nuclear generators than give away thousands on tax incentives to common folks!!!!!!!!!! Pay them enough and they will install!!!!!!!!!!!!!!!!! (**0039-3** [Hedges, Jean])

Response: *These comments discuss in part the cost effectiveness of nuclear power relative to alternative power sources. The NRC does not promote the use of nuclear power as a preferred energy alternative, and it does not regulate energy alternatives that do not involve nuclear power. The NRC does, however, evaluate energy alternatives as part of its review under NEPA for applications of new nuclear power plants. The discussion of alternative energy sources in Chapter 9 of the EIS will describe potential impacts from these sources in comparison with the proposed action. A discussion of the costs of the proposed projects will be provided in Chapter 11 of the EIS. Because the NRC is not involved in establishing energy policy but rather, in regulating the nuclear industry to protect the public health and safety within existing policy, issues related to the subsidization/tax incentives of nuclear power are outside the scope of the NRC's mission and authority and will not be addressed in the EIS. The environmental and health risks (both long- and short-term) of both constructing and operating two new reactors on the Lee site will be addressed in Chapters 4 and 5 of the EIS. In addition, the environmental and health impacts from the nuclear fuel cycle, related transportation impacts, and decommissioning of the nuclear facility will be addressed in Chapter 6 of the EIS. The overall environmental and health costs of the proposed project, as well as the expected benefits, will be summarized in Chapter 11 of the EIS.*

Comment: Whereas anxiety about global climate change and a growing energy shortage is leading to calls for more nuclear power plants, often overlooked are facts that nuclear power is massively expensive and risky. Without federal subsidies and incentives, including liability insurance, risk insurance for delays, production tax credits and loan guarantees totaling billions of dollars, Duke would not and could not consider construction of these 2 proposed reactors. Furthermore, during such proposed construction, rate payers would be expected to pay in advance, even if such facilities were never completed. While projected construction costs continue to rise, already each proposed new reactor will likely cost at least 6 billion dollars. (**0015-1** [Patrie, Dr. Lew])

Response: *The NRC is not involved in establishing energy policy; rather, it regulates the nuclear industry to protect public health and safety within existing policy. Issues related to the subsidization and incentives of nuclear power are outside of the NRC's mission and authority and will not be addressed in the EIS. The purpose of the EIS is to disclose potential* *environmental impacts of building and operating the proposed nuclear power plant. The determination for the impact of building and operating a nuclear power plant on retail power rates is not under NRC's regulatory purview. However, Chapter 11 of the EIS will address the estimated overall costs and environmental impacts of the proposed project.*

Comment: Estimates of the cost of nuclear power plants vary by billions. Cost overruns are usual. Is a nuclear power plant a wise investment? And who will pay? Should our Federal government pay for such endeavors--at taxpayer expense, of course? Can we vote on it (**0034-5** [Karpen, Leah R.])

Response: *This comment expresses concern regarding the cost of building nuclear power plants. The applicant, Duke, is responsible for all costs incurred in constructing the Lee Nuclear Station. Because the NRC is not involved in establishing energy policy but rather, in regulating the nuclear industry to protect public health and safety within existing policy, issues related to the subsidization of nuclear power are outside of the NRC's mission and authority and will not be addressed in the EIS. The benefit-cost balance for the project will rely on the best available estimate of project timing and duration, with uncertainties noted. Chapter 11 of the EIS will address the estimated overall costs and environmental impacts of the proposed project.*

Comment: The planning for the new reactors, including the Westinghouse AP1000 design, has skyrocketed. Florida utilities pursuing the same design have estimated the cost of $6-8.5 billion for one reactor. That's tripling the cost from just one year ago. And a few days ago, a Charlotte Observer article reported that Duke conceded that its original cost estimate of $6 billion is out of date. (**0001-16** [Barczak, Sara])

Comment: Nuclear power is the lowest cost producer of baseload electricity. The average production cost is $1.76 per kilowatt-hour and that's including the cost of operating and maintaining the plant, purchasing the fuel and paying for management of used fuel. (**0001-77** [Blue, Lilly])

Comment: The overnight cost of these plants, six to nine billion dollars, what about the many years that the plants are going to take to build? I heard someone mention $20 billion. We have no idea. But I'll tell you, I really am offended by Duke because they say in the fact sheet that nuclear power is economical but where's the cost of the thing? We are intervening before the Public Service Commission against so-called pre-construction costs for these units. And Duke is fighting tooth and nail not to reveal the costs. The South Carolina legislature basically allowed pre-construction costs last year, but we feel that the public, we have a right to know what we're going to be paying for these things in South Carolina or in any other state. (**0001-136** [Clements, Tom])

Comment: [T]he Duke site that's being looked at, there was about $500 million spent out there to build reactors in the 1980s and they turned that into a film studio where the Abyss was filmed.

And I have a great fear we're going into another abyss. Massive pre-construction costs are going to be pumped into the site, the ratepayers are going to be saddled with it and then I'd like to see what local people are going to be saying about the economic benefits while the South Carolina legislature has guaranteed that you're going to have to pay for something that you never get. (**0001-137** [Clements, Tom])

Comment: Duke Power acknowledged that the cost of this energy future for them may embody as much as 120 percent increase in existing electric rates. And yet as the previous speaker spoke, Duke Power Company absolutely refuses to disclose the cost estimates to the consumer for the Lee project, as well as the cost that it projects for the alternatives, most obviously the alternative of increased energy efficiency. I charge NRC with responsibility of forcing Duke to be forthcoming in those costs and to include all of them in your environmental analysis. The environmental costs have been well addressed by others and I won't repeat them, but we know the costs are there, cost of nuclear waste, the risk of accidents, the impacts to the water resources of the Broad River. (**0001-172** [Guild, Bob])

Comment: Why are the true costs of all associated activities not being factored into Duke's projections? (**0007-14** [Arnason, Deb])

Comment: The high cost of nuclear power plants will likely lead to cost overruns and rate increases; this is not mentioned in the application. The price for new reactors, such as Westinghouse's AP1000 design that TVA intends to use, has skyrocketed. Utilities in Florida pursuing the same reactor design have recently stated costs of $6 to $8.5 billion per reactor, nearly tripling their estimates from just one year ago. Just a few days ago, a Charlotte Business Journal article reported that Duke conceded that its original cost estimate of $6 billion is out of date. (**0009-5, 0049-5** [Barczak, Sara])

Comment: It was also recently decided by the NC Utilities Commission that Duke's updated cost estimates are trade secret and don't need to be made public. Does the NRC have access to these 'secret' 'costs? If so, how will the public know that the NRC compared the most current costs of the proposed new nuclear plant appropriately when comparing to other energy sources or energy efficiency measures? If the NRC is not able to see these 'secret' cost figures, how can the NRC appropriately determine that building new reactors is the right decision? (**0009-6** [Barczak, Sara])

Comment: Nuclear power is expensive. Duke is reluctant to publish financial data, but experts say that nuclear reactors today cost between 6 and 9 billion dollars each to construct. Duke plans two. (**0035-3** [Hamrick, Mike])

Response: *The benefit-cost balance for the project will rely on the best available estimate of project timing and duration, with uncertainties noted. Chapter 11 of the EIS will discuss the estimated overall costs and environmental impacts of the proposed project.*

Comment: The EIS also should include the cost for the cradle to grave responsibility for waste, impacts of that waste on the health and economic welfare of the public for waste throughout the process it goes through. This process should include any reprocessing that's done, any subsequent processing until this waste reaches its final resting place. There's no reason why the nuclear industry, if it is as safe as they say, should not itself be responsible for this waste from cradle to grave. And I ask that that cost be included in the EIS scope. (**0001-200** [Rudolf, Jerry])

Response: *The NRC is not involved in establishing energy policy; rather, it regulates the nuclear industry to protect public health and safety within existing policy. The impacts of the nuclear fuel cycle will be addressed in Chapter 6 of the EIS. The environmental and health risks (both long- and short-term) of both constructing and operating two new reactors on the Lee Nuclear Station site will be addressed in Chapters 4 and 5 of the EIS. The overall environmental and health costs of the proposed project, as well as the expected benefits, will be summarized in Chapter 11 of the EIS.*

Comment: Is it worth the money that everybody's talking about, the billions of dollars, billions of dollars, to provide these jobs for people that their family is going to be affected further down the road, cancer and all kind of disease, whatever, is going to come into the water and the chemicals and whatever. A lot of families live on the Broad down there where this nuclear site is at and everybody down there eats the fish, they swim in the river and play in the river. It's like a livelihood to them. And y'all change everybody's livelihood. (**0001-121** (Blackwood, Andy))

Comment: NRC has an obligation under the National Environmental Policy Act to fully consider without prejudice or preconceptions the holistic cost to the human and natural environment of this proposed action, the Lee Nuclear Station, as compared to the alternatives and benefits. (**0001-170** [Guild, Bob])

Response: *The environmental and health risks (both long- and short-term) of both constructing and operating two new reactors on the Lee site will be addressed in Chapters 4 and 5 of the EIS. The discussion of alternative energy sources in Chapter 9 of the EIS will describe potential impacts from these sources in comparison with the proposed action. The overall environmental and health costs of the proposed project, as well as the expected benefits, will be summarized in Chapter 11 of the EIS.*

Comment: North and South Carolina both currently enjoy low electricity prices, a substantial part of which is due to the efficiencies and cost-effectiveness of operating our current nuclear power plants. Upfront construction costs for nuclear power plants are large but the operating life span and low operating cost of nuclear power plants must also be factored in.

I ask that the environmental impact statement take a comprehensive look at lifetime costs of building and operating the proposed new nuclear plants. And additionally, a comparison of lifetime costs of any alternatives. I believe that nuclear will be competitive with the alternatives. (**0001-123** [Chisolm, Sarah])

Response: *This comment discusses the cost effectiveness of nuclear power relative to alternative power sources. The NRC does evaluate energy alternatives in applications for new nuclear power plants as part of its review in accordance with NEPA requirements. The discussion of alternative energy sources in Chapter 9 of the EIS will describe potential impacts from these sources in comparison with the proposed action. A discussion of the costs of the proposed projects will be included in Chapter 11 of the EIS.*

Comment: The EIS should include the cost to the public for the public assumption of risk. The Price-Anderson Act caps the Duke Power financial risk for catastrophic events and the rest of that risk goes to the public. The cost of this risk can be calculated using standard methods like the insurance industry uses. These costs would include things like the health impacts, cost of care and compensation, probably the impact on business and the economy in the world. (**0001-199** [Rudolf, Jerry])

Response: *The NRC is not involved in establishing energy policy; rather, it regulates the nuclear industry to protect public health and safety within existing policy. Thus, matters related to the Price-Anderson Act of 1957 are outside the scope of this review and will not be included in the EIS. However, the EIS will include an evaluation of potential health impacts of operating a nuclear plant on the Lee site in Chapter 5. In addition, the safety assessment for the proposed licensing action was provided as part of the application. The NRC is in the process of developing a SER that analyzes all aspects of construction and operational safety. The NRC will only issue a license if it can conclude that there is reasonable assurance that: (1) the activities authorized by the license can be conducted without endangering public health and safety, and (2) such activities will be conducted in compliance with the rules and regulations of the NRC.*

D.2 The Supplemental Scoping Process

The supplemental public scoping meeting regarding Make-Up Pond C was held on June 17, 2010, at the Restoration Church International in Gaffney, South Carolina. The meeting summary and meeting transcript are available electronically in the NRC Public Document Room or from ADAMS at accession numbers ML101800406 and ML101760446, respectively.

D.2.1 Overview of the Scoping Processes

At the Gaffney meeting, 34 attendees provided oral or written comments that were recorded and transcribed by a certified court reporter. In addition to the oral comments and written statements submitted at the public meetings, the NRC received 17 emails and 6 letters containing comments during the supplemental scoping period. At the conclusion of the supplemental scoping period, the NRC staff reviewed the scoping meeting transcript and all written material received during the comment period and identified individual comments. These comments were organized according to topic within the proposed EIS or according to the general topic, if outside the scope of the EIS. Once comments were grouped according to subject area, the staff determined the appropriate response for the comment.

The comments from the supplemental scoping period and their responses were published in the *Environmental Impact Statement Supplemental Scoping Process Regarding Make-Up Pond C Summary Report, William States Lee III Nuclear Station Units 1 and 2 Combined Licenses, Cherokee County, South Carolina* (ML103220015). To maintain consistency with the Scoping Summary Report, the correspondence ID number along with the name of the commenter used in that report is retained in this appendix.

Table D-3 identifies in alphabetical order the individuals who provided comments during the supplemental scoping period, their affiliations, if given, and the ADAMS accession number that can be used to locate the correspondence. Although all commenters are listed, the comments presented in this appendix are limited to those within the scope of the environmental review.

Table D-3. Individuals Providing Comments During Supplemental Scoping Comment Period

Commenter	Affiliation (if stated)	Comment Source and ADAMS Accession #	Correspondence ID
Arnason, Deb		Letter (ML101740338)	0010
		Meeting Transcript (ML101760446)	0001-6
Barczak, Sara	Southern Alliance for Clean Energy	Letter (ML101900426)	0030
Barnett, Barbara A.	Four Seasons Sierra Committee of Henderson Co. NC	Email (ML101750764)	0021
	League of Women Voters of Henderson Co., NC	Email (ML101750764)	0021
		Meeting Transcript (ML101760446)	Comments the same as Correspondence ID #0021
Bliss, Rachel		Letter (ML101740335)	0009
		Meeting Transcript (ML101760446)	0001-20

Table D-3. (contd)

Commenter	Affiliation (if stated)	Comment Source and ADAMS Accession #	Correspondence ID
Boger, Paul	Greater York Chamber of Commerce	Meeting Transcript (ML101760446)	0001-13
Breckheimer, Steve		Email (ML102290307)	0037
Brooks, Tim	Nestle Prepared Foods	Meeting Transcript (ML101760446)	0001-8
Clements, Tom	Friends of the Earth	Email (ML092680877)	0002
		Meeting Transcript (ML101760446)	0001-31
Cook, Jim	Cherokee County Development Board	Meeting Transcript (ML101760446)	0001-26
Corbett, Susan	Chair, South Carolina Sierra Club	Meeting Transcript (ML101760446)	0001-30
Craig, Anne		Letter (ML101740334)	0008
		Meeting Transcript (ML101760446)	Comments the same as Correspondence ID #0008
Cross, John	URS JSCC Project	Email (ML101740616)	0026
Dolan, Bryan	Duke	Meeting Transcript (ML101760446)	0001-5
Drake, Joan W.		Email (ML101760352)	0023
Fair, Gabriel	Students for Environmental Action	Meeting Transcript (ML101760446)	0001-22
Forrester, Mike	State Representative District 34	Meeting Transcript (ML101760446)	0001-3
Gregg, Ben	South Carolina Wildlife Federation	Letter (ML101820646)	0032
Haire, Wenonah G.	Catawba Indian Nation	Letter (ML102110494)	0039
Hale, Kendall		Email (ML101720639)	0003
Hallock, Judith		Letter (ML102030057)	0034
Hancock, Mandy	Southern Alliance for Clean Energy	Letter (ML101740336)	0011
		Letter (ML101820355)	0011

Table D-3. (contd)

Commenter	Affiliation (if stated)	Comment Source and ADAMS Accession #	Correspondence ID
		Letter (ML101820355)	0030
		Letter (ML101900426)	0030
		Meeting Transcript (ML101760446)	Comments the same as Correspondence ID #0011
Hansborough, Hilbert J.		Letter (ML101890551)	0028
Hicks, Katie	Clean Water for North Carolina	Letter (ML101740343)	0017
		Meeting Transcript (ML101760446)	Comments the same as Correspondence ID #0017
Hildebrandt, Lorena		Meeting Transcript (ML101760446)	0001-23
Hogue, David	Mayor of Blacksburg, SC	Meeting Transcript (ML101760446)	0001-4
Hopper, Sara	South Carolina Manufacturers Alliance	Meeting Transcript (ML101760446)	0001-14
Howarth, Robert F.	Western N. Carolina Physicians for Social Responsibility	Letter (ML101740337)	0012
		Meeting Transcript (ML101760446)	0001-27
Ledford, Judy and Glenn		Email (ML101750766)	0022
LeVander, Valerie	Global Warming Task Force of Henderson Co. NC	Letter (ML101740342)	0016
		Meeting Transcript (ML101760446)	Comments the same as Correspondence ID #0016
Littlejohn, Lanny F.	South Carolina	Letter (ML101740332)	0007
McCall, Pat		Email (ML101720649)	0018
Mixon, Michael C.	Shaw Power Group	Email (ML101740613)	0027

Table D-3. (contd)

Commenter	Affiliation (if stated)	Comment Source and ADAMS Accession #	Correspondence ID
Mominee, Katharine N.	DBNPS Chemistry	Email (ML101720644)	0019
Moss, Dennis Carroll	South Carolina	Letter (ML101740333)	0007
		Meeting Transcript (ML101760446)	0001-1
Moss, Steve	South Carolina	Letter (ML101740331)	0007
		Meeting Transcript (ML101760446)	0001-2
Olsen, Mary	Southeast Office of Nuclear Information and Resource Service	Letter (ML101740340)	0014
		Meeting Transcript (ML101760446)	0001-15
Pace, Eric	Carolina Chapter of the N. American Youth Generation in Nuclear	Meeting Transcript (ML101760446)	0001-21
Peeler, Harvey S.	South Carolina	Letter (ML101740344)	0007
Pennington, Lee		Letter (ML102030058)	0033
Richards, Kitty-Katherine		Meeting Transcript (ML101760446)	0001-19
Richardson, Don	Western North Carolina Physicians for Social Responsibility	Letter (ML101740341)	0015
		Meeting Transcript (ML101760446)	0001-25
Robbs, Kayla	Cherokee Co. Chamber of Commerce	Meeting Transcript (ML101760446)	0001-18
Scott, Darrell	South Carolina Chamber of Commerce	Meeting Transcript (ML101760446)	0001-10
Smith, Brian		Email (ML101750767)	0024
Smith, Clyde E. (Butch)	Cleveland County Water	Letter (ML102070103)	0035

Table D-3. (contd)

Commenter	Affiliation (if stated)	Comment Source and ADAMS Accession #	Correspondence ID
Swinton, D.C.	Palmetto Environmental Action Coalition	Meeting Transcript (ML101760446)	0001-24
Thomas, Bill	Pisgah Group, NC Sierra Club	Email (ML101810248)	0029
Thomas, Ellen		Email (ML102290314)	0038
		Letter (ML101740339)	0013
Thrift, Debbie	Cliffside Modernization Project	Email (ML101740618)	0025
Vejdani, Vivianne	SC Department of Natural Resources	Letter (ML102160393)	0036
Ware, Steve	Nestle Prepared Foods	Meeting Transcript (ML101760446)	0001-7
Williams, Debralee		Meeting Transcript (ML101760446)	0001-28
Wilson, Caroline D.	South Carolina Dept. of Archives and History	Email (ML101720651)	0020
Zeller, Lou	Blue Ridge Environmental Defense League	Meeting Transcript (ML101760446)	0001-9

D.2.2 Supplemental Scoping In-Scope Comments and Responses

The in-scope comment categories for the supplemental scoping process are listed in Table D-4 in the order that they are presented in this EIS. The comments and responses for the in-scope categories are included below the table. Parenthetical numbers shown after each comment refer to the comment ID number (correspondence number-comment number) and the commenter name.

Table D-4. Supplemental Scoping Comment Categories in Order as Presented in this Appendix

D.2.2.1	Comments Concerning Process – COL
D.2.2.2	Comments Concerning Process – NEPA
D.2.2.3	Comments Concerning Site Layout and Design
D.2.2.4	Comments Concerning Land Use – Site and Vicinity
D.2.2.5	Comments Concerning Hydrology – Surface Water
D.2.2.6	Comments Concerning Hydrology – Groundwater
D.2.2.7	Comments Concerning Ecology – Terrestrial
D.2.2.8	Comments Concerning Ecology – Aquatic
D.2.2.9	Comments Concerning Socioeconomics
D.2.2.10	Comments Concerning Historic and Cultural Resources
D.2.2.11	Comments Concerning Health – Radiological
D.2.2.12	Comments Concerning Accidents – Severe
D.2.2.13	Comments Concerning the Uranium Fuel Cycle
D.2.2.14	Comments Concerning Transportation
D.2.2.15	Comments Concerning Decommissioning
D.2.2.16	Comments Concerning Cumulative Impacts
D.2.2.17	Comments Concerning the Need for Power
D.2.2.18	Comments Concerning Alternatives – Energy
D.2.2.19	Comments Concerning Alternatives – System Design
D.2.2.20	Comments Concerning Benefit-Cost Balance

D.2.2.1 Comments Concerning Process – COL

Comment: A number of you were at the scoping meetings in 2008, and I'm quite concerned that at that time this issue of insufficient water was not addressed during scoping. A lot of the members of the public spoke out, and the NRC has said that tonight, and I want a full explanation of why the issue of inadequate water for the reactors was not discussed at that time, and I don't think that we've heard that reason tonight. (**0001-31-1** [Clements, Tom])

Comment: Duke was aware of water demands at the time of the EIS scoping meeting so it is hard to understand why this lake is being proposed now and not at the start of the whole EIS process. This reflects very poorly on both Duke and the NRC in that the water supply and use issue was of concern to the public 1.5 years ago and the low-flow impacts well-known at that time. (**0002-3** [Clements, Tom])

Comment: If the NRC had been on its toes and truly working in the public interest, this issue of need for more water would have been on the table from the start of the environmental review process. That the NRC did not realize or admit the stresses being posed to the Broad River by the proposed reactors, as was reflected in a letter from the SC Department of Natural Resources, with which I'm sure you are familiar, is hard to accept. This does call into question the NRC's ability to adequately review Duke's environmental documentation. (**0002-4** [Clements, Tom])

Comment: I expect a full public explanation to be offered both by the NRC and Duke as to why we have only learned this far along into the process about the need for a new make-up water lake (of unknown size). Many of us saw this coming a long time ago and speculated on the possibility that Duke would pose a new lake, so either the NRC and Duke are way behind in their analysis of impacts to the Broad River or the plan for a new lake existed earlier and is only just now being revealed. But I am open to any other explanation as to why we are only learning about this proposed lake at this late point. (**0002-5** [Clements, Tom])

***Response**: The NRC's regulations that implement the National Environmental Policy Act of 1969 (NEPA) are contained in Title 10 of the Code of Federal Regulations (CFR) Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions." Title 10 CFR 51.29(a)(2) states that scoping will "Determine the scope of the statement and identify the significant issues to be analyzed in depth." Scoping for the environmental impact statement (EIS) should ensure that public and agency concerns are identified early and properly studied. In the case of Make-Up Pond C, it was during the original scoping process that the South Carolina Department of Natural Resources (SCDNR) identified the need for a contingency supply of cooling water during periods of low flow in the Broad River. The identification of the Broad River low-flow issue by SCDNR is an example of how NEPA and the scoping process were successfully implemented. As a result, Duke Energy Carolinas, LLC (Duke) amended the Lee Nuclear Station project by adding the proposed Make-Up Pond C to* *serve as a source of supplemental cooling water during low-flow periods in the Broad River. The NRC and the U.S. Army Corps of Engineers (USACE) considered this a big enough change to the Lee Nuclear Station project scope to necessitate another round of scoping and another public scoping meeting.*

The SCDNR letter can be found in the NRC Agencywide Documents Access Management System (ADAMS) under Accession No. ML081430553 (SCDNR 2008). ADAMS is accessible at http://www.nrc.gov/reading-rm/adams.html. Persons who do not have access to ADAMS or who encounter problems in accessing the documents located in ADAMS should contact the NRC Public Document Room reference staff by telephone at 1-800-397-4209 or 301-415-4737, or via e-mail at pdr@nrc.gov.

The NRC and the USACE are in the process of examining the environmental impacts of building and operating the Lee Nuclear Station (and Make-Up Pond C) and will address water use issues in Chapter 5 of the draft EIS. At the time of the original and supplemental scoping periods, the NRC was not in the position to make any preliminary determinations regarding environmental impacts associated with the proposed Lee Nuclear Station.

Comment: Again, back to the issue of federal agencies working together and disclosure. You're working with the Army Corps of Engineers; that's good. But how about the National Oceanic and Atmospheric Administration? How about the projections for the droughts that are on their records for this area? (**0001-15-11** [Olsen, Mary])

***Response**: Title 10 CFR 51.28 identifies who should be invited to participate in the scoping process, which includes Federal, State, and local agencies, and affected Native American tribes. The NRC's environmental review process invites other governmental agencies to assess whether or not they should be considered cooperating agencies under the regulatory structure afforded by the President's Council on Environmental Quality. The environmental review process also invites these agencies to identify whether or not they have a particular expertise on an issue that may be invaluable to the NRC, or have consultation roles under other statutes that have a bearing on site-specific issues.*

For the Lee Nuclear Station environmental review, the NRC has contacted Federal agencies such as the U.S. Fish and Wildlife Service and the American Council on Historic Preservation, numerous Native American tribes, and South Carolina and North Carolina resource agencies. As the comment states, the USACE Charleston District is participating in the environmental review as a cooperating agency. The NRC may also use data from other Federal and State agencies when evaluating the environmental impacts of building and operating the Lee Nuclear Station.

Comment: A couple years ago reactors, like I said earlier, were closed down because of a drought in our area in Tennessee. I want to be assured that the Army Corps of Engineers and the NRC can be trusted with this project. (**0001-20-3** [Bliss, Rachel])

Comment: I want to be assured that the Army Corp of Engineers and the NRC can be trusted with this project. In recent years they have failed us along with corporations they regulate. (**0009-3** [Bliss, Rachel])

Comment: I know you cannot (for reasons I fail to understand) address anything but this permit and have brought our concerns to the further attention of Congress and the President. (**0010-5** [Arnason, Deb])

Comment: I have been here before with the NRC when I attended Gaffney SC hearing on this Lee reactor May 1, 2008. I was informed, in a joking way, by a NRC employee that my opposition was useless and this Lee Reactor was a foregone conclusion. (**0010-9** [Arnason, Deb])

***Response**: NRC approval of an application for a combined license (COL) is not a foregone conclusion. The NRC's responsibility is to regulate the nuclear industry to protect public health and safety, and the environment. Accordingly, the licensing process for COL applications is specified in 10 CFR Part 52. The NRC's environmental regulations are contained in 10 CFR Part 51 and guidance for NRC staff responsible for environmental review of new reactor license applications is documented in NUREG-1555 (NRC 2000), Standard Review Plans for Environmental Reviews for Nuclear Power Plants. The environmental review process includes a detailed review of an applicant's COL application, and considers public comments received during scoping periods as well as consultations with Tribal, State, and Federal agencies to determine the environmental effects of building and operating the nuclear power facility.*

By letter dated February 10, 2009, NRC received official notice of the USACE's interest in becoming a cooperating agency for the Lee COL EIS (ADAMS Accession No. ML090690283) (USACE 2009). The NRC agreed by letter dated March 30, 2009 (ADAMS Accession No. ML090700384) to invite USACE to serve as a cooperating agency in the preparation of the EIS for this licensing action (NRC 2009). USACE is committed to following the letter of the law (i.e., the Clean Water Act) as it applies to the proposed Lee Nuclear Station project.

Comment: The Catawba wishes to be consulted on any ground disturbing activities on this project. (**0039-1** [Haire, Wenonah G.])

***Response**: As outlined in 36 CFR 800.8(c), "Coordination with the National Environmental Policy Act of 1969" (NEPA), the NRC is coordinating compliance with the National Historic Preservation Act, Section 106, in fulfilling its responsibilities under NEPA. The NRC will consult with the Catawba Indian Nation for NRC-authorized activities associated with the Lee Nuclear Station COL application. The Catawba Indian Nation will have an opportunity to consult and* *comment on the project through the NEPA process. The NRC will provide the Catawba Indian Nation copies of Duke's responses to NRC requests for additional information and associated cultural resource reports.*

Comment: I believe if more people in support of these projects were kept well informed there would be a greater attendance and more of a show of support. I was not aware of the public hearing last week or I too would have attended in person. (**0025-2** [Thrift, Debbie])

***Response**: The NRC staff used a number of methods to inform the public about the scoping meeting. The "Notice of Intent to Conduct a Supplemental Scoping Process for the Supplement to the Environmental Report" was published in the Federal Register on May 24, 2010 (75 FR 28822). In addition, public notice was provided through local newspaper ads and press releases, as well as on the NRC website. Meeting announcements were published in the following local newspapers: The Gaffney Ledger, Spartanburg Herald-Journal, York Enquirer-Herald, The State* (Columbia)*, Blacksburg Times, Charlotte Observer, and Gaston Gazette. The staff appreciates the concern raised by the commenter and will continue to look for ways to improve public notification of these meetings.*

D.2.2.2 Comments Concerning Process – NEPA

Comment: So cutting now to the scoping issues, the National Environmental Policy Act does allow consideration of options, of course; that's what the whole process is. There's a no-action alternative. But currently I have never heard of a federal agency being honest about the situation that we're in with this site. (**0001-15-3** [Olsen, Mary])

***Response**: The no-action alternative; i.e., denial of COL, energy conservation and efficiency, demand-side management, new generation alternatives, purchased electrical power, alternative energy technologies (including renewable energy resources such as wind and solar), and the combination of alternatives will be addressed in Chapter 9 of the EIS. For acceptable alternatives, the potential for environmental impacts will be assessed against that of the proposed Lee Nuclear Station. If one of the acceptable alternatives is environmentally preferable to the proposed action, economic impacts will also be compared.*

D.2.2.3 Comments Concerning Site Layout and Design

Comment: A couple things about the AP-1000 reactor, and I want to point out a few things because the NRC hasn't done it, from the environmental report. If people don't know, the reactors that are being looked at here have never been built anywhere in the world. They are under construction in China, but they have never been built anywhere. The design is not certified in the United States, and they do not have a license from the Nuclear Regulatory

Commission. So why is so much site preparation going on at the Duke site here and at the SCE&G site if the reactors aren't even licensed and the whole overall project does not have a license? (**0001-31-4** [Clements, Tom])

***Response**: Revision 15 of the Westinghouse AP1000 Design Control Document (DCD) is a certified design (10 CFR Part 52, Appendix D). In its COL application (Duke 2007), Duke referenced Revision 17 to the AP1000 DCD (Westinghouse 2008), which NRC accepted for review but has not yet approved. NRC regulations allow the applicant for a COL to reference a design that is undergoing design certification. Site preparation activities not related to nuclear safety, also termed preconstruction activities, may be performed by the applicant prior to the conclusion of the COL application review. The impacts of preconstruction activities will be addressed in Chapters 4 and 7 of the EIS. Applicants engaging in preconstruction activities do so at their own risk as NRC approval of an application for a COL is not a foregone conclusion. This comment provides no new information related to the environmental review of the proposed action and will not be addressed in the EIS.*

D.2.2.4 Comments Concerning Land Use – Site and Vicinity

Comment: Flooding the area for Make-Up Pond C will flood valuable farmland (**0037-7** [Breckheimer, Steve])

***Response**: A description of current land uses, as well as land-use impacts during development and operation of the proposed facilities will be discussed in Sections 2.2, 4.1, and 5.1 of the EIS. Additionally, Chapter 10 will discuss Irreversible and Irretrievable Commitments of Resources, in accordance with Section 102(2)(C)(v) of NEPA.*

D.2.2.5 Comments Concerning Hydrology – Surface Water

Comment: I do want to mention briefly the construction of Pond C. Pond C is a critical component to the Lee Station's success. Duke Energy also evaluated the environmental impact of the pond and concluded that it would result in the least impact to the environmental as compared to other options. (**0001-10-4** [Scott, Darrell])

Comment: We're talking about water withdrawals; we're talking about Pond C. We are in a situation where power generated with steam is causing two-thirds of the water we take out to not produce any power at all. It's just thermodynamics; it's just condensing steam back to water to make power. So if we do the numbers on this site, the projections are more than 30 million gallons a day, but round down to make it easy: 30 million gallons a day that's actually like, you know, going off the site as steam. Two-thirds of that, or 20 million gallons, didn't even make electric power. (**0001-15-7** [Olsen, Mary])

Comment: I think it's time that our federal agencies put into their disclosures the withdrawal of water that could be drinking water, that could be used in an environmental natural ecosystem versus uselessness. (**0001-15-8** [Olsen, Mary])

Comment: I'm concerned about the state of the Broad River if another containment pond is built using water that would ordinarily go into the Broad River directly. We need further information about how this water use will affect communities downstream (**0001-20-1** [Bliss, Rachel])

Comment: Duke Energy's proposal for this cooling lake demonstrates the flaws of the Lee nuclear reactor plans in regards to water. According to Section 5.2.1 of Duke's report on the environmental impacts of the Make-Up Pond C, the necessity of this cooling lake is due to the need to compensate for low flow on the Broad River. They admit in their report that the region has been drought-stricken in the past and continues to be. My question to the Nuclear Regulatory Commission, as well as Duke Energy, is why permit or build a nuclear reactor, which, according to the Department of Energy, is the highest water consumer of any energy technology, in a drought-prone area, especially when, according to climate models, we face an escalating threat of future droughts in the region. (**0001-23-1** [Hildebrandt, Lorena])

Comment: I'd also like to see information in the environmental report on how long the make-up ponds would last in case of low flow and drought in the Broad River. (**0001-23-2** [Hildebrandt, Lorena])

Comment: I want to know now how much evaporation there is from the lake and what's going to replace the evaporated water. Is that going to come from this tiny little creek? Or is it going to be pumped from the Broad River? (**0001-31-10** [Clements, Tom])

Comment: Also, what happens to London Creek when the lake is emptied down to its lowest amount and possibly there's not any discharge to the Broad River? We heard that it's going to go down to 17,500 acre feet, I believe, so what happens to the creek under these circumstances? (**0001-31-11** [Clements, Tom])

Comment: As I said, you don't have to be against nuclear power to be concerned about how this is going to impact the Broad River. We heard at the earlier scoping meeting, we heard tonight that if this project goes forward, the name of the Broad River is going to have to be changed to the Skinny River, but I'd go just a little bit further. Because of the hot water being discharged into the river, that's going to affect aquatic life downstream, we might well just have to change the name to the Hot & Skinny River, because that may well be the case if this goes forward. (**0001-31-16** [Clements, Tom])

Comment: And it does appear that this reactor project hinges on this new lake. It's down to the water in a new lake to provide cooling water for the reactors during low flow. And to me, this is an admission of the vulnerability of the project, that it's not really viable, that this is the wrong place for nuclear reactors, even if you're pro-nuclear. If you want nuclear reactors to be built, this is not the place to do it, because the Broad River is not large enough to handle these reactors. (**0001-31-2** [Clements, Tom])

Comment: And I want to dispute something that was said earlier by the representatives who spoke and by the Chamber of Commerce. We heard them say that the new water withdrawal bill that was passed by the legislature this year and signed by the governor is going to regulate these new reactors. Well, that's quite interesting to hear, because at the Nuclear Advisory Council -- the Governor's Nuclear Advisory Council meeting last Thursday a spokesperson from the Department of Health and Environmental Control made clear the new bill does not regulate water withdrawal for nuclear reactors. That's the role of the Federal Energy Regulatory Commission. So there's not going to be any control by the state, it appears. I asked one of the representatives outside to please clarify, and he didn't really want me asking him the question, because they want to make the presentation that the state is going to regulate the water withdrawal, and I don't think that's the case. To read the law it's very unclear, but DHEC's interpretation is that the reactors are not regulated. (**0001-31-3** [Clements, Tom])

Comment: And I wanted to point out -- and some people have already done this, but pulling directly from the Duke environmental documents, they say that 60,000 gallons per minute will be withdrawn from the river, with a use of 28,000 gallons per minute, maximum. According to my calculations, this is 86 million gallons a day withdrawn from the river, and 41 million gallons used through evaporative cooling. (**0001-31-5** [Clements, Tom])

Comment: Also, the environmental report says that Make-Up Pond C will have a maximum depth of approximately 116 feet, that the dam height will be 132 feet, and to me -- and its 620 acres in size. And to me this is a lake and it's not a pond. The environmental report -- and I think this is something that you really need to think about -- says, London Creek, on which the lake would be built, was flowing during both the March and September 2008 sampling events, when they were doing this study. However, between sampling events, London Creek ceased to flow in many places due to severe to extreme drought conditions in the region. And it goes on to say, "Prior to the September sampling period, riffle areas in London Creek dried up, leaving only isolated pools". We're talking about a small creek that's going to provide the emergency water that's need in low-flow periods of the river. This is not a sizeable body of water on which this lake is being proposed. (**0001-31-6** [Clements, Tom])

Comment: I'd like to make a request and then just point out some things that I'd like to see the EIS cover. I request that the NRC, in the tables, provide the volumes in gallons per minute as well as acre-feet, because when you read them, you have to make the interpretations yourself, and the question already came up tonight and the NRC couldn't answer that: How many acre-feet were in gallons. (**0001-31-7** [Clements, Tom])

Comment: Also the question needs to be explained: How many days' worth of use of water for cooling is in this lake? As I recall from the environmental document, it's only a few. This is only going to provide extra operating capacity. I don't know; maybe it's five days. It's not going to provide a margin for keeping the reactors going in any case if there's an extreme drought like we had a few years ago. (**0001-31-8** [Clements, Tom])

Comment: And I want to know how much discharge there is from the new lake into the Broad River at different flows of the river. At some point is there going to be no water discharged from the -- from London Creek and the lake into the river, because it's all being captured for storage? (**0001-31-9** [Clements, Tom])

Comment: An evaluation of the water needs for the station was included as a part of the environmental report. This included a thorough analysis of many factors, such as available water sources; upstream, downstream water users' needs; environmental considerations, and station water needs. It also included a review of historical data, including the potential impact of drought conditions on area water resources and station operation. The Ninety-Nine Islands reservoir will be the primary source of water in this station. In addition, the site currently has two ponds; one designed for station use during drought periods instead of using the Ninety-Nine Islands reservoir. These ponds can be refilled from rain, runoff, and water from Ninety-Nine Islands reservoir during high river flow periods. (**0001-5-2** [Dolan, Bryan])

Comment: Based on our additional evaluation and discussions, as well as alternatives for use, where we considered other options for maximizing the efficient use of water and minimizing our environmental impact, we determined adding another pond on the Lee site would provide additional drought contingency during prolonged droughts and further ensure the availability of water for the regional ecology and downstream water users. (**0001-5-3** [Dolan, Bryan])

Comment: Comments on Make-Up Pond C: And I'm glad you provided some information, and I would like some more, as people have requested: the size of the pond relative to evaporation needs of the reactor. But I'd like those over the life of the reactors. (**0001-6-2** [Arnason, Deb])

Comment: Duke's nuclear power plant at Lee, if constructed, would consume four times as much water as all public and industrial users in Cherokee County combined. (**0001-9-2** [Zeller, Lou])

Comment: Given that we have long know about the possible stresses to the Broad River by the consumptive use of water by the proposed Lee reactors, as was raised more than a year ago during scoping comments, it strikes me as strange that Duke has now come back to propose a new cooling-water lake. It was quite clear last year that the low flow of the Broad River - which one person during oral scoping comments said should be renamed the Skinny River if the reactor project went forward - would not be sufficient to supply both the reactors and provide water for the flow of the river during low-flow periods. (**0002-2** [Clements, Tom])

Comment: Nuclear power plants use enormous amounts of water; in a era of increasing drought and water shortages, we cannot afford to do this. (**0003-4** [Hale, Kendall])

Comment: My understanding is Duke Energy will withdraw the water needed to operate the Lee plant from the Broad River at the Ninety-Nine Islands Reservoir, and that during drought conditions Duke will rely on drought contingency ponds as the source of water for the plant's needs rather than withdrawing water from the Broad River. This seems prudent to me because it will allow for the water in the river during low-flow conditions to be available for downstream users and for protecting the river's ecology. As a South Carolina legislator, I am familiar with the South Carolina Surface Water, Permitting, Use and Reporting Act which was approved by the S.C. legislature and signed by the Governor earlier this month. Duke's proposed plans to withdraw water from on-site drought contingency ponds, during drought periods, is perfectly aligned with what our state environmental permitting and environmental resource agencies advocated in this legislation. Specifically, the legislation states that when minimum flow conditions exist in the river, the water withdrawer is to stop withdrawing consumptive quantities of water from the river and begin withdrawing water from a supplemental source such as a drought contingency pond. Duke Energy is proposing the construction of an additional drought contingency pond, which it would utilize during prolonged drought periods. I fully support Duke's request to construct this additional drought contingency pond. Again, I want to point out that Duke's plans to use two drought contingency ponds during low river flow conditions directly aligns with the expectations and requirements stated in the S.C. surface water legislation. (**0007-2** [Littlejohn, Lanny F.] [Moss, Dennis Carroll] [Moss, Steve] [Peeler, Harvey S.])

Comment: The production of nuclear power compromises our safety in several areas including our right to clean, non radioactive water sources. (**0008-2** [Craig, Anne])

Comment: I am concerned about the state of the Broad River, if another containment pond is built using water that would ordinarily go into the Broad river directly. We need further information about how the water use will affect communities downstream. (**0009-1** [Bliss, Rachel])

Comment: Although Duke has submitted a supplemental plan to construct an additional source of water to be designated Make-Up Pond C, I cannot fathom how it would be enough, especially in times of drought and water wars between southern States. This must also be projected at least 20 years out considering climate change is rapidly drying up this area. How dare we allow for-profit corporations to suck us dry? (**0010-1** [Arnason, Deb])

Comment: I would hope you are aware that each existing and each new reactor will EVAPORATE millions of gallons of water PER DAY PER REACTOR (35Mgw/day@Lee) -unlike paltry lawn watering or car washing regulations where at least the water will find its way back into the water table of the region where it is used! (**0010-2** [Arnason, Deb])

Comment: I have a joke for you, although it's not original: Granting this permit will turn the Broad River into the Skinny River. Please now take my concerns seriously or the fallout will be on all of us. (**0001-6-4** [Arnason, Deb])

Comment: Does Duke Energy assure you they have the technology and expertise to prevent any disasters or, in this specific case, provide enough water to make up for their projected water evaporation without sacrificing the needs of human beings for fresh water over the next 20 years or the life of the reactor? How can anyone believe that when the future is so uncertain? (**0010-4** [Arnason, Deb])

Comment: The application also mentions that average surface water use (public and industrial) in Cherokee County was 8.4 million gallons per day. This means that on a daily basis the Lee plant could use six to ten times the amount of surface water used by everyone else in the county combined. The plant will be competing with other important water users in South Carolina and the region. Yet, the application does not acknowledge the impacts this may have, nor does it ponder the impacts this could have during severe drought conditions, such as we regularly experience. The NRC needs to address all of these serious issues in the draft EIS. (**0011-11** [Hancock, Mandy])

Comment: The Broad River, from which the Lee site will rely, is already stressed from the drought and a variety of industrial and municipal users. Further, other proposals, such as Duke's efforts to expand the Cliffside coal plant in NC, and SCE&G's proposal to build two reactors in Jenkinsville, SC also aim to use huge amounts of water from the Broad River. The full extent of these proposed impacts are not discussed in the application. The NRC needs to analyze not only the Broad River of today, but the Broad River of tomorrow, which is slated for more development. The application even states that an estimated 56 percent increase in water demand is projected from 1997 to 2020 for the North Carolina portion of the Broad River basin. How will the Broad River be able to provide enough water for all these needs? (**0011-12** [Hancock, Mandy])

Comment: The proposal to impound the Broad River to create a 620 acre make up pond would forever alter the ecosystem of this area. These risks are not adequately addressed in Duke's revised report. (**0011-2** [Hancock, Mandy])

Comment: Duke and the NRC already know that this region has historically suffered from severe droughts as Duke's revised report references the 2005 South Carolina Water Use Report Summary that says the last multi-year drought was in 2008. The National Drought Mitigation Center shows the immediate vicinity of Gaffney to be currently suffering abnormally dry conditions. The Supplement lists recorded statewide droughts since 1925 that show a pattern of getting more frequent and longer lasting droughts. The proposal of creating Make Up Pond C is simply illogical-what actually makes sense is to pursue less water intensive energy options to begin with instead of costly engineering measures that will negatively impact the environment, add to the cost, and ultimately waste even more water. (**0011-7** [Hancock, Mandy])

Comment: According to Duke's application, the two Lee reactors will withdraw during normal use 50-86 million gallons of water per day (mgd) from the Broad River 9 and consume, or lose, 35-41 mgd resulting in an overall consumptive loss of approximately 50-70%.'?? This is unacceptable in a region in which water resources are already stressed. (**0011-9** [Hancock, Mandy])

Comment: Duke and SCG&E are planning Cliffside Coal Plant and 5 nuclear reactors on the Broad (2 at Lee in Gaffney and 3 at Summer in Jenkinsville). This is not sustainable and jeopardizes the entire Broad River watershed and drinking source for Columbia, SC. (**0013-10** [Thomas, Ellen])

Comment: The water withdrawals from the Broad River are in direct conflict with drinking water needs of Columbia, SC and will have its greatest impact during draught when the water needs of the City will be greatest. (**0014-2** [Olsen, Mary])

Comment: We strongly oppose the proposed reactors for many reasons. First, the water evaporation from the Broad River due to cooling operations would be unacceptable. The Broad River already receives hot discharges and loses water from THREE other existing or planned nuclear reactors in SC and a coal plant in NC. In addition to the 47 million gallons of water per day the facility would withdraw, returning only a quarter of this amount, our calculation based on the reactor specifications indicate that the facility could cause evaporation of up to five and a half BILLION gallons per year in "forced evaporation" downstream due to hot discharges. This reduced flow is harmful to wildlife and reduces the amount of water available to downstream communities, such as Union and Columbia, who use the Broad as a drinking source. Construction of cooling pond C would not improve the state of the Broad River, as London Creek is tributary to the river, and thus any evaporation from the pond will impact overall river flows. The mean monthly discharge of many NC rivers and streams has been generally decreasing in the past decade, due to two extended periods of drought. Especially with these drought conditions and the possibility of interstate water conflicts, a closer examination of the allocation implications of permitting these reactors is imperative. (**0017-1** [Hicks, Katie])

Comment: I strongly urge development of at least the third pond identified in the June 18, 2010 Craig Peters Report distributed by NEI. There is no debate regarding paramount concerns for confidence and assured availability of uninterrupted cooling water sources, and there have been recent instances of extreme drought in the southern regions.. There is not debate that all engineering / mechanical advantages available to provide uninterrupted water source must be perused. It is my opinion that additional water ponds should also be considered for simple process water hold-up. Typical examples would be a hold up pond for circulating cooling water to provide short term hold up on site for oxidation biocide degradation and/or station drain run-off hold-up ponds for the inadvertent oil leaks, both providing short term hold-up/mitigation potential prior to return to open water sources. (**0019-2** [Mominee, Katharine N.])

Comment: Water is an issue. Droughts and heat waves cause nuclear reactors to be unreliable and inoperable because federal regulations require plants to shut down when water temperatures reaches 90 degrees. (**0021-4** [Barnett, Barbara A.])

Comment: The Lee plants cannot function without 50 million gallons of water a day from the Broad River and 35 million gallons would evaporate from the cooling towers. Nuclear Reactors would consume four times as much water as all public and industrial users in Cherokee County combined (Duke Energy License Application Environmental Report Sec. 2.3.2). In the summer South Carolina is hot and humid with daytime temperatures averaging near 90 degrees and have reached 100 degrees. (**0021-5** [Barnett, Barbara A.])

Comment: This nuclear plant will require the construction of a lake to ensure a reliable source of cooling water, consuming up to 55 cubic feet of water per second from the Broad River. With global warming/climate change there can be no assurance that the flow of the Broad River will remain at its current levels or that its water will be essential for drinking or agriculture in the future. (**0029-6** [Thomas, Bill])

Comment: The proposal to impound the Broad River to create a 620 acre make up pond would forever alter the ecosystem of this area. These risks are not adequately addressed in the Environmental Report and must be thoroughly examined by the Nuclear Regulatory Commission (NRC) in the draft Environmental Impact Statement (DEIS).
(**0030-1** [Barczak, Sara] [Hancock, Mandy])

Comment: This region has historically suffered from severe droughts. Yet Duke's application references the 2005 South Carolina Water Use Report Summary that says the last multi-year drought was in 1998. The National Drought Mitigation Center shows the immediate vicinity of Gaffney to be currently suffering abnormally dry conditions. The Supplement lists recorded statewide droughts since 1925 that show a pattern of getting more frequent and longer lasting. The proposal of Make Up Pond C, to be used to provide supplemental water during drought and/or low flow periods in a region prone to severe drought and temperatures, seems extreme and dangerous. (**0030-5** [Barczak, Sara] [Hancock, Mandy])

Comment: According to Duke's application, the two Lee reactors will withdraw during normal use 50-86 million gallons of water per day (mgd) from the Broad River and consume, or lose, 35-41 mgd, returning only 30-50% back to the river. Overall consumptive loss will be approximately 50-70%. This is unacceptable in a region in which water resources are already stressed. The application also mentions that average surface water use (public and industrial) in Cherokee County was 8.4 million gallons per day. This means that on a daily basis the Lee plant could use six to ten times the amount of surface water used by all other users in the county combined. Though the proposed plant will be competing with other important water users in South Carolina and the region, the application does not acknowledge the impacts this may have, nor does it ponder the impacts this could have during severe drought conditions. The NRC needs to address this in the DEIS. (**0030-6** [Barczak, Sara] [Hancock, Mandy])

Comment: The Broad River, from which the Lee site will rely, is already stressed from the drought and a variety of industrial and municipal users. Further, other proposals, such as Duke's efforts to expand the Cliffside coal plant in North Carolina, and SCE&G's proposal to build two reactors in Jenkinsville, South Carolina at the V.C. Summer site also aim to use huge amounts of water from the Broad River. The full extent of these cumulative impacts is not discussed in the application. The NRC needs to analyze not only the Broad River of today but also the Broad River of tomorrow, which is slated for more development. The application states that an estimated 56 percent increase in water demand is projected from 1997 to 2020 for the North Carolina portion of the Broad River basin. How will the Broad River be able to provide enough water for all these needs? (**0030-7** [Barczak, Sara] [Hancock, Mandy])

Comment: Also, downstream of the proposed Lee facilities the Broad River enjoys our state's Scenic River status, reflecting a stream of exceptional quality and diversity. Hence, measures to protect these assets are not only prudent, but should be required by the license and related permits. (**0032-2** [Gregg, Ben])

Comment: It is our understanding that Duke's proposed water withdrawals are consistent with the spirit, intent, and specifications of the [South Carolina Surface Water Withdrawal and Reporting] Act. (**0032-4** [Gregg, Ben])

Comment: the proposed water management plan presented by Duke appears consistent with the requirements of its FERC license for the Ninety-Nine Islands Hydroelectric Station. (**0032-5** [Gregg, Ben])

Comment: I am not satisfied that there will be enough water to service this proposed reactor due to our severe recent drought and associated water evaporation. (**0034-1** [Hallock, Judith])

Comment: Given the fact that the proposed power plant is a regional solution we are perplexed as to why Duke Energy has not considered a more regional option to supply the additional storage of water for the project. CCW has been working for more than 10 years on the development of a reservoir on the First Broad River to supply potable water for our water system as well as the City of Shelby water system. CCW presented this idea to Duke Energy during its study of the Broad River Water Supplies conducted in 2007. It is our understanding that Duke's study indicated there was an inadequate supply of water from the Broad River during extreme drought conditions and that an additional supply of raw water was needed for cooling water for the proposed Lee Nuclear Station. Duke's conclusion as to inadequate water supply supports the position of CCW as to the need for an additional supply of raw water. (**0035-2** [Smith, Clyde E. (Butch)])

Comment: Now that a second reservoir is needed (Make-up pond C) CCW requests that USNRC and the USACOE re-evaluate the use of a proposed joint reservoir on the First Broad River. (**0035-3** [Smith, Clyde E. (Butch)])

Comment: The ER Supplement states that the proposed Make-Up Pond C would be an off-site, man-made reservoir, formed by impounding London Creek; a tributary of the Broad River, northwest of Make-Up Pond B. Make-Up Pond C would be used to provide supplemental water during drought and/or low flow periods. Make-Up Pond C would be filled using water pumped through Make-Up Pond A and Make-Up Pond B, or directly from the Broad River. The Make-Up Pond C dam would be downstream of Lake Cherokee and upstream of the confluence of London and Little London creeks. The Make-Up Pond C dam crest elevation would be 660 ft msl, and the spillway crest elevation would be 650 ft msl. Make-Up Pond C would have a maximum depth of approximately 116 ft and a total storage volume of approximately 22,000 ac-ft. The surface area at the normal pond level of 650 ft msl would be approximately 620 ac. The usable storage capacity would be approximately 17,500 ac-ft. Normal water surface elevation for the proposed Make-Up Pond C would be 650 ft. At times when natural stream flows to Make-Up Pond C are inadequate to maintain a full pool condition, the reservoir would receive supplemental inflows from the Broad River. If permitted, Pond C, at 632 acres would be the largest reservoir permitted in the state of South Carolina since Lake Russell in the mid-l 970s. (**0036-1** [Vejdani, Vivianne])

Comment: The proposed flooding of approximately 6 mi of stream will require mitigation for unavoidable impacts to waters of the U.S. as required by section 404(b)(1) of the Clean Water Act, consistent with criteria set forth in the Federal Mitigation Rule (Rule). The Rule establishes set criteria, or elements, that must be addressed in every mitigation plan. Among these 12 elements is the collection of baseline information for the impact site. In keeping with this requirement, a geomorphological assessment of the entire reach of London Creek and its tributaries within the impact zone should be conducted. This geomorphological assessment should include, but not be limited to, the following:

- Dimension, pattern and profile features of London Creek and its tributaries,
- Bankfull width, discharge and velocity of London Creek,
- Substrate analysis for London Creek and tributaries, and
- Inventory of riffle/pool complexes, falls, shoal areas and woody debris in London Creek and tributaries.

These baseline monitoring parameters will be necessary to ensure that aquatic habitat quality in the mitigation reaches is commensurate with impacted reaches, and appropriate mitigation is provided to replace lost values and functions of London Creek and its tributaries if they are impounded.

In order to adequately mitigate all identified impacts, the Licensee will be required to develop a comprehensive mitigation plan. For impacts to the amount of wetlands and stream that will be involved to develop Pond C, such a mitigation plan should encompass more than simple wetland and stream impact restoration and compensation. DNR requests continued discussion with the Licensee and appropriate regulatory agencies regarding mitigation to include identification of the potential impacts to fish, wildlife and habitat resources by the construction of Pond C. (**0036-12** [Vejdani, Vivianne])

Comment: DNR has concluded the Licensee has conducted a thorough and exhaustive review of the need for obtaining additional water supply for safe operation of the proposed facility during periods of extreme drought. A number of the alternatives that have been put forward for additional water supply represent engineering solutions exceeding the capability for DNR analysis. DNR is satisfied the Licensee has identified the least damaging alternative to natural resources for provision of additional water supply based on comparison of alternative supplemental water supply options. (**0036-13** [Vejdani, Vivianne])

Comment: The proposed Pond C would back up to and interface directly with the Lake Cherokee dam, thus resulting in a number of potential impacts, such as the need for modification of the existing dam and emergency spillway, fencing and rip-rap of the down slope. DNR and the Licensee have been engaged in productive discussion regarding avoidance and minimization of impacts to Lake Cherokee and its public use. (**0036-3** [Vejdani, Vivianne])

Comment: There is not enough water from the river to feed additional nuclear plants; the water will be needed for drinking and growing food. During extended drought, the units will have to be taken off line when the pond water runs out. (**0037-5** [Breckheimer, Steve])

Comment: Duke and SCG&E are planning to expand Cliffside Coal Plant and want to add 5 new nuclear reactors (2 at Lee in Gaffney and 3 at Summer in Jenkinsville) on the mis-named Broad River, perhaps hoping that there will be no droughts such as those in 2005 and 2008. This jeopardizes the entire Broad River watershed and drinking source for Columbia, SC -- and other farms and towns downstream, all the way to the Atlantic. (**0038-1** [Thomas, Ellen])

Comment: The C-Pond would wipe out a substantial piece of forest, and would be dependent upon a stream which is known to have dried up during the drought of 2008, or (if pumped out of the Broad River) would significantly reduce the amount of water that would be needed downstream for agriculture and drinking water. (**0038-5** [Thomas, Ellen])

***Response**: In the EIS, the review team will describe Make-Up Pond C, disclose the impacts to water resources, and discuss possible alternatives that would either eliminate the need for Make-Up Pond C or reduce its impacts. In Chapter 3, the review team will describe Make-Up Pond C and the dam that will impound the water that will form Make-Up Pond C. In Sections 4.2.1 and 5.2.1, the review team will discuss alterations of the hydrological system that will result during the development of Make-Up Pond C and during the operation of Make-Up Pond C, including the projected changes in downstream flows and the overall water budget for the plant during operation. In Sections 4.2.2 and 5.2.2, the review team will disclose the impacts to water resources, including downstream flows under current and reasonably foreseeable future conditions. In Section 9.4, the review team will discuss possible alternatives to the proposed system design that could either eliminate the need for Make-Up Pond C or reduce its impacts.*

Comment: I see from the report you sent me that this is probably a useless exercise once again since this public comment supplemental scoping process is designed to weed out anything but comments on Make-Up Pond C for which you admittedly do not provide clear or easily-accessed information (size of pond relative to evaporation needs of reactor over the life of the said reactor(s), impacts on source and disbursement of pond water or radioactive contaminants expected, effects on environment in best and worst case-scenarios, etc.) (**0010-8** [Arnason, Deb])

***Response**: As stated in the response above, the draft EIS will present the results of the review team's analysis of environmental impacts associated with construction and operation of the proposed Lee Nuclear Station and Make-Up Pond C. The NRC maintains a webpage that contains links to documents associated with the Lee Nuclear Station COL review – http://www.nrc.gov/reactors/new-reactors/col/lee.html – including Duke's Environmental Report, the supplement to the Environmental Report regarding Make-Up Pond C, responses to the NRC's requests for additional information, meeting notices and summaries, and other information.*

Comment: Can you tell me if the proposed new impoundment is on the Lee reactor site or actually on the Broad River itself? (**0002-1** [Clements, Tom])

***Response**: The proposed Make-Up Pond C would be located northwest of the Lee Nuclear Station on London Creek, a tributary of the Broad River.*

D.2.2.6 Comments Concerning Hydrology – Groundwater

Comment: We are also on well water. The last time they were blasting and working at that site, some people in the area lost their wells and water. What are your plans to see we have plenty of safe water? Who should we contact in case we have a problem with our water supply? (**0033-2** [Pennington, Lee])

***Response**: The purpose of the EIS is to disclose the environmental impacts of constructing and operating the proposed Lee Nuclear Station. Section 2.3 of the draft EIS will address groundwater resources and Sections 4.2 and 5.2 will address potential impacts to groundwater during construction and operation of the proposed Lee Nuclear Station. The NRC has no jurisdiction over the business practices of private entities, and issues regarding these private business practices will not be addressed in the EIS.*

D.2.2.7 Comments Concerning Ecology – Terrestrial

Comment: How many trees are going to be cut during construction of the lake? And as far as I'm aware, this is a forested area. So a square mile of forest is going to be lost in South Carolina due to the construction of this lake. (**0001-31-15** [Clements, Tom])

Comment: You are clearing for the lake and the site? (**0033-4** [Pennington, Lee])

***Response**: Land will be cleared both for construction of the proposed Lee Nuclear Station and for Make-Up Pond C. The Make-Up Pond C area is largely forested. Land clearing impacts for both will be addressed in Chapter 4 of the EIS.*

Comment: We already have a problem with wild animals in this area. What are doing about the animals in the area? (**0033-3** [Pennington, Lee])

***Response**: It is unclear to which local wild animal problem the comment refers; therefore, the comment cannot be specifically addressed. However, the potential effects of the construction of the proposed Lee Nuclear Station on invasive biota will be addressed in Chapter 4 of the EIS.*

Comment: Sufficient information has been provided by the Licensee to evaluate the impact of the proposed Pond C on vegetation and cover. In addition to these studies, the Licensee hosted a 2-day site visit to allow DNR staff botanists to conduct a preliminary assessment of vegetation at the London Creek site. DNR personnel observed the London Creek riparian corridor to be minimally disturbed as compared with similar sites in the foothills of the upstate. While the ridge tops are impacted by silviculture practices, the steeper, north-facing bluffs demonstrate little disturbance. The lack of invasive, exotic species attests to the site's relative integrity. (**0036-5** [Vejdani, Vivianne])

***Response**: Biological information from available sources, including Duke and the South Carolina Department of Natural Resources will be used to describe the plant and animal communities in the Make-Up Pond C area in Chapter 2 of the EIS. A discussion of existing disturbances to and the relative integrity of extant terrestrial resources (including invasive species) in the Make-Up Pond C area will also be included.*

Comment: The ER Supplement states that London Creek and its associated tributaries and forest cover likely provide a localized travel corridor for some species to and from the Broad River (Ninety-Nine Islands Reservoir) floodplain. This area is a travel corridor for migrating passerine birds which have been demonstrated to use major rivers and associated riparian corridors during migration periods. (**0036-6** [Vejdani, Vivianne])

Comment: 2.4.1.2.2 Birds The following observations were noted:

- A high number of migrant songbird species were observed, indicating that a diversity of migrant species use the forested stream corridor during migration. The connectivity of forested wetlands and river systems has been demonstrated to be important to neotropical migrants. Forested areas are used because they provide the highest density of food resources. Migrant birds have, in some cases, flown thousands of miles and are building reserves to reach breeding grounds and successfully reproduce;
- The widths of riparian stream zones at the London Creek site provides mixed hardwood forest habitat that is becoming more limited in the upstate; and
- Steep rock formations create cove systems within the London Creek site, south of where they are commonly located, contributing to a diversity of habitat for bird species.

(**0036-7** [Vejdani, Vivianne])

***Response**: Biological information from available sources, including Duke and the SCDNR, will be used to describe the plant and animal communities and their functions in the Make-Up Pond C area in Chapter 2 of the EIS. A discussion of migratory bird use of the London Creek watershed as a travel corridor to and from the Broad River floodplain; the contribution of wide riparian corridors to the relative integrity of the Make-Up Pond C area; and the contribution of cove systems to the diversity of avian habitat also will be included. Potential impacts to these communities from construction and operation of the proposed Lee Nuclear Station will be discussed in Chapters 4 and 5 of the EIS.*

Comment: Results of the herpetology study conducted by the Licensee's consultant indicate that, of 66 species that potentially occur onsite, 41 of these species were documented onsite (approximately 60% of potential species). The list of potential species comprised 25 amphibians and 41 reptiles. The study documented the presence of 19 amphibian species (76% of the potential species) and 18 reptile species (43% of the potential reptile species). Observing such a high percentage of potential species within a 1.5-year sampling period is an indication that the site supports a relatively healthy and diverse amphibian and reptile assemblage. Likewise, the salamander diversity observed at the London Creek site also is indicative of a relatively healthy and functional system. The herpetology survey documented 8 of 11 potential salamander species (72% of potential species). (**0036-8** [Vejdani, Vivianne])

***Response**: Herpetofauna communities in the Make-Up Pond C area will be described in Chapter 2 of the EIS. A discussion of the diversity and relative integrity of the herpetofauna communities will also be included.*

Comment: The Licensee proposes a 300 ft buffer around the Pond, 50 ft of which is proposed to be cleared, grubbed, grassed and maintained to prevent debris from washing into the reservoir. DNR concurs with the proposed 300 ft buffer but does not support clearing, grubbing, grassing and maintaining a 50 ft buffer adjacent to the shoreline. Pond C would likely naturalize and support a variety of aquatic life and wildlife. Riparian zones perform numerous ecological functions to include, but not be limited to: riparian plant communities provide excellent food, cover, and nesting sites for a variety of wildlife species and detritus and woody debris are an important source of energy and cover for aquatic life. Canopy cover helps to maintain water quality by reducing surface water temperatures. Riparian zones function as biofilters and remove nutrients and other pollutants from stormwater runoff before it enters rivers, lakes and streams. DNR looks forward to continued discussion with the Licensee in order to explore other alternatives for preventing debris from entering intake structures. (**0036-2** [Vejdani, Vivianne])

***Response**: The NRC has no jurisdiction over land-clearing practices by Duke. Disposition of the 50-ft cleared buffer that was proposed all the way around and adjacent to Make-Up Pond C remains under discussion between Duke and the South Carolina Department of Natural Resources. The resolution of this issue and any associated impacts will be addressed in Chapter 4 of the EIS.*

D.2.2.8 Comments Concerning Ecology – Aquatic

Comment: DNR conducted a fisheries survey of London Creek per South Carolina Stream Assessment protocol on 12 May 2010. Eighteen species were collected during this sampling event (17 native species), including 4 state conservation priority species. The fish assemblage was similar overall to that reported by the Licensee from their 2008-2009 fish survey. No additional species to those reported by the Licensee were discovered. The sample section was well forested and exhibited habitat conditions consistent with an intact Outer Piedmont watershed with substrate heterogeneity. At the time of DNR sampling, flows were above average. Sampling conducted by the Licensee did not demonstrate the presence of piscivorous fish in London Creek. (**0036-10** [Vejdani, Vivianne])

Comment: Twenty-eight crayfish collections were made by Duke Energy in 2008 and 2009; these were collected and examined in May 2010 to determine species composition. In addition, crayfishes were sampled by DNR and Duke Energy personnel in 2010. Crayfishes collected from London Creek in the area proposed for impoundment (Pond C footprint) included:

- *Cambarus* sp. cf. *acuminatus* (*Cambarus* sp. C) (listed in the ER Supplement as *Cambarus acuminatus*; it is an undescribed species being studied by John Cooper at North Carolina State Museum of Natural Sciences),
- *Cambarus reduncus* (species collected by Duke Energy but not listed in the ER Supplement), and
- *Procambarus acutus*

None of the crayfish species are of conservation concern in South Carolina. Neither shells nor live individuals of any native freshwater mussels were encountered during any of the surveys conducted by DNR in 2010, and they were not discovered by the Licensee during the 2008 and 2009 surveys; thus, London Creek does not appear to support any native mussel species. (**0036-11** [Vejdani, Vivianne])

Comment: The Licensee conducted surveys for fish and macroinvertebrates in 2008. These surveys provide sufficient information regarding fish and macroinvertebrate resources. In addition to this information, DNR conducted a preliminary assessment of fishery and macroinvertebrate communities of London Creek and its tributaries. This assessment revealed that the proposed reservoir will represent the loss of intact Piedmont watershed and associated aquatic habitats and species. Overall, London Creek currently exhibits physical conditions consistent with a quality Piedmont stream, including a forested riparian corridor, channel sinuosity and habitat (riffle/pool) diversity, and coarse, clean substrate composition. London Creek is subject to the fluctuating flows typical of similar Piedmont streams.
(**0036-9** [Vejdani, Vivianne])

***Response**: Biological and physical information from available sources, including Duke and the South Carolina Department of Natural Resources, will be used to describe the aquatic communities in and around London Creek in Chapter 2 of the EIS. Potential impacts on these communities from construction and operation of the proposed Lee Nuclear Station will be addressed in Chapters 4 and 5 of the EIS.*

Comment: One of the more challenging hurdles is the issue of minimum release (minimum in-stream flows) from any proposed reservoir. This minimum release is being required by a number of different organizations and resource agencies, including the US Fish and Wildlife Service (USF&WS). We trust that the USNRC and the USF&WS will impose the same requirements for minimum release if the Pond C option is pursued. CCW has discovered that this minimum release, depending upon the number, can have a major impact on the safe yield of any reservoir. The minimum release could impact the size of the proposed 620 acre pond C reservoir. (**0035-4** [Smith, Clyde E. (Butch)])

***Response**: The NRC does not impose requirements for minimum in-stream flow; however, construction and operation of Make-Up Pond C would require authorizations from the USACE (Clean Water Act, Section 404) and the South Carolina Department of Health and*

Environmental Control (Clean Water Act, Section 401) and these agencies could require a minimum in-stream flow. Because the EIS will likely be finalized before such permits are obtained, details of minimum flow requirements, if any, will not be included in the EIS. However, the potential for minimum flow requirements and the potential impacts of station operation on Make-Up Pond C and London Creek will be addressed in Chapter 5 of the EIS.

Comment: And what is the impact to the river of water discharged during low flow that has been heated up, as we've heard before from other speakers, in the lake before it's discharged into the river, if it in fact is discharged? (**0001-31-12** [Clements, Tom])

Comment: What's the impact of siltation to the river during construction? (**0001-31-14** [Clements, Tom])

Comment: "Thermal pollution" kills plants, fish, and other organisms, stressing the entire environment. The proposed W.S. Lee nuclear power plant could withdraw 47 million gallons of water per day from the Broad River and return only 1/4 back to the river. Hot water discharge and the release of radioactive contaminants and hazardous chemicals threaten wildlife and human health. (**0013-4** [Thomas, Ellen])

***Response**: The review team will consider water-quality impacts resulting from construction and operation of the proposed Lee Nuclear Station on the Broad River, including siltation and temperature (thermal) effects, in Chapters 4 and 5 of the EIS. Cumulative water-quality impacts from the proposed Lee Nuclear Station will be addressed in Chapter 7 of the EIS.*

Comment: The Broad River is an irreplaceable resource to our state, providing a unique suite of habitats critical for both wildlife and outdoor recreation. In this reach of the Broad River we have one of the state's few small mouth bass fisheries. (**0032-1** [Gregg, Ben])

***Response**: The Broad River as it relates to wildlife resources and recreation, including the smallmouth bass (Micropterus dolomieu) fishery, will be addressed in Chapter 2 of the EIS. Potential impacts on these resources from construction and operation of the proposed Lee Nuclear Station will be addressed in Chapters 4 and 5 of the EIS.*

Comment: The availability of Make-Up Pond C will essentially establish a floor for withdrawals from the river under these severe conditions. Shifting to Make-Up Pond C will, therefore, substantially mitigate the impacts of the proposed LNS operations during these especially sensitive periods, thereby providing for baseflows protective of recreational and riparian needs downstream, as well as for habitat and wildlife. (**0032-3** [Gregg, Ben])

***Response**: The potential impacts on downstream habitats and recreational activities from Make-Up Pond C operation during drought periods will be addressed in Chapter 5 of the EIS.*

D.2.2.9 Comments Concerning Socioeconomics

Comment: But let's not overlook the other factors that Lee Nuclear Station will bring to this area: the 700-plus jobs that will be permanent for operation of the plant and the average salary that will approach $70,000. The majority of the employees will live in the county; they will spend their money in the county. There will be an influx of approximately 1000 to 1500 additional personnel each year for refueling needs, which will also generate additional revenue in the form of purchasing of food, living accommodations, and other items. There will be several million dollars that will be collected by the county for property taxes. These taxes will be used to improve schools, and as we all know, we do need improvements in our school systems. There will be operating expenses that will be met for the school systems. It will also help fund county services. (**0001-13-2** [Boger, Paul])

Comment: So one point that I want to bring from a worker that I know in Texas about jobs is that while there may be 400 jobs advertised and there may be a multiplier effect that we've heard about this evening from various people, the other multiplier effect is the spouse who comes without a job, because most of these 400 people will move into the area because they require specialized training that's not available in the local community, and they bring with them a spouse and very often one or more teenagers, all of whom are looking for jobs. So you get 400 jobs and about 800 job seekers, so the net for Gaffney is not necessarily an increase in employment -- Gaffney, Blacksburg, this general area. (**0001-15-2** [Olsen, Mary])

Comment: And then all of the major big reactor parts, the vessel and all those things, are made in Japan or South Korea. They have to be ordered years in advance and brought here. We don't make them; we don't have forges big enough in this country. We lost our steel industry -- our big forges years ago.

And so none of this stuff is actually made in the United States. All those jobs, all that money that we're spending to buy that is going to foreign countries. (**0001-30-3** [Corbett, Susan])

Comment: Lee Nuclear Station will benefit our state in other ways, namely by creating thousands of construction jobs, providing hundreds of well paying jobs for decades to come, stimulating the local economy through the addition of service jobs to support the nuclear plant and its workers, and providing a low-cost, safe, reliable, carbon-free, environmentally responsible source of electricity to our citizens.
(**0007-1** [Littlejohn, Lanny F.] [Moss, Dennis Carroll] [Moss, Steve] [Peeler, Harvey S.])

Comment: I have worked several outages within the industry and know how beneficial these plants could be not only to the local economy there in Gaffney but to the entire upstate region. (**0026-2** [Cross, John])

Comment: These proposed plants in the Gaffney area would create an economic boon like nothing that has been experienced in the area and would create hundreds of permanent jobs and the opportunity for many other jobs for the re-fueling outages and work that comes with it. Locoal [sic] housing would benefit, local business and hotels would benefit, local economy as a whole would benefit and South Carolina get s new, clean, viable power source. (**0026-5** [Cross, John])

Comment: Not only will these plants boost the local economy like never before it will sub -stain a large number of Full time jobs to the area but also will see added temporary jobs during re-fueling and so on. I think that It not need mentioned but this area of the country has lost many of its local jobs to the overseas textile industry causing many local residents to be un-employed. (**0027-2** [Mixon, Michael C.])

Comment: Workers to run the plant will be brought in from outside the county and will not employ Cherokee County residents. (**0037-6** [Breckheimer, Steve])

Comment: Because of the economy, Duke Power is dredging up support in communities near the proposed plant with promises of jobs and cheap energy. Both of these promises are suspect. (**0038-2** [Thomas, Ellen])

Comment: Historically, most of the people who build and maintain nuclear power plants are seasoned workers who come from other places. They bring families into the community who compete for existing jobs. Once the plant is built, the construction crew will either leave town or be unemployed. (**0038-3** [Thomas, Ellen])

***Response**: Regional socioeconomic impacts such as impacts on the economy, employment, taxes, housing and schools associated with the construction and operation of the proposed Lee Nuclear Station will be considered in Chapters 4 and 5 of the EIS.*

Comment: I would like to see nuclear energy developed in this area. There really is no economic development going on here at this time. I own a 5800 square foot commercial building on Old Georgia Highway in Gaffney and there is no market for it or other similar buildings because there is no new industry in the area. (**0024-1** [Smith, Brian])

Comment: I am thankful that the Duke-Cliffside Modernization Project has provided many jobs for not only NC but also SC and surrounding states and a much needed update to this facility. (**0025-3** [Thrift, Debbie])

***Response**: These comments generally express support for the proposed action based on the potential positive socioeconomic impacts it would be expected to bring to the region. Socioeconomic impacts from construction and operation of the proposed Lee Nuclear Station will be addressed in Chapters 4 and 5 of the EIS.*

Comment: What happens as population, agriculture needs grow? Will these containment ponds continue to be licensed? (**0001-20-2, 0009-2** [Bliss, Rachel])

***Response**: Socioeconomic impacts, such as population growth, will be addressed in Chapters 4 and 5 of the EIS.*

Comment: The ER Supplement indicates the Licensee proposes no public use of the proposed reservoir. DNR appreciates the sensitive nature of operation of a nuclear generation station, however, London Creek constitutes waters of the U.S. and any impacts to it for purposes of a reservoir the size of the one being proposed should include an examination of compatible public use opportunities. These compatible public use opportunities might include fishing and boating opportunities and other compatible appreciative uses along the northern boundary, etc. DNR looks forward to continued discussion with the Licensee regarding potential, compatible public use opportunities on a portion of the proposed Pond C. (**0036-4** [Vejdani, Vivianne])

***Response**: Recreational impacts will be addressed in Chapters 4 and 5 of the EIS. Providing public access for recreational activities on or within Make-Up Pond C is outside the scope of NRC's regulatory authority. The USACE role in the EIS as a cooperating agency on the EIS will be addressed in Section 1.3 and its discussion of environmental impacts related to the Clean Water Act in Section 9.5.*

D.2.2.10 Comments Concerning Historic and Cultural Resources

Comment: Based on the description of the Area of Potential Effect (APE) for the project and the identification of historic properties within the APE, SHPO concurs with the assessment that no historical properties listed in or eligible for listing in the National Register of Historic Places will be adversely affected by this project. Also, SHPO concurs with the recommendation for the plans to relocate the Service Family Cemetery (38CK142).

Our office is reviewed the eligibility of the Cherokee Falls Mill Village, as proposed in the survey. We have determined that the village is not eligible for listing on the National Register of Historic Places. (**0020-1** [Wilson, Caroline D.])

***Response**: Historic and cultural resources will be addressed in Chapter 2 of the EIS, and impacts on these resources will be discussed in Chapters 4 and 5. The South Carolina State Historic Preservation Officer's concurrence with the assessment of no historic properties adversely affected within the area of potential effects for Make-Up Pond C, concurrence with plans to relocate the Service Family Cemetery, and assessment of the Cherokee Falls Mill Village as ineligible for listing on the National Register of Historic Places will be incorporated into these chapters as part of compliance with the National Historic Preservation Act, Section 106 review process.*

Comment: [Flooding the area for Make-Up Pond C] could cover unique archeological sites. Any environmental impact study should include an archeological survey of the area. (**0037-8** [Breckheimer, Steve])

***Response**: The Make-Up Pond C project area has been surveyed for historic and cultural resources, including an inventory and assessment of archaeological sites. The results of this survey will be summarized in Chapter 2 of the EIS and impacts will be addressed in Chapters 4 and 5.*

D.2.2.11 Comments Concerning Health – Radiological

Comment: I'd like impact on source and dispersement of pond water or radioactive contaminants that you expect. I'd like the effects on the environment in the best- and worst-case scenarios, just like this BP thing would certainly have been avoided if something had been looked into beforehand. (**0001-6-3** [Arnason, Deb])

Comment: I'm talking about uranium 235 and plutonium. Just as an example -- and of course these plants turn out a couple hundred isotopes of various half-lives. But look at 238, the so-called depleted uranium. It's all over the Middle East from these shells that were used to penetrate tanks, and they're pyrophoric, so they vaporize, and they float off in the air, and they're in the ground, and the children play in them.

238: It is a half-life of 4-1/2 billion years. That's the half-life of 238: 4-1/2 billion years. How old is this planet? 4-1/2 billion years. Not to worry; it'll be safe in ten half-lives, which is 45 billion years. Some of us aren't going to be here then.

So we have contaminated -- we have already contaminated this earth, the only one we've got, forever. This earth is permanently contaminated with radiation. Everybody in this room -- I'm a doctor, and I've looked into this. Everybody in this room has got some strontium-90 in his bones -- his or her bones.

Your bones, of course, surround your bone marrow, which makes your red and white cells and your platelets, and exposure to radiation by white cells results in leukemia, so the leukemia rate is bound to go up over the years. I'm sorry to say this, but we're all contaminated. (**0001-25-4** [Richardson, Don])

Comment: There is no safe level of radiation. Any potential leak threatens our water and the entire Broad River watershed (**0003-5** [Hale, Kendall])

Comment: I personally would not want to drink water that has just earlier that day been used to cool a nuclear power plant. (**0009-5** [Bliss, Rachel])

Comment: There is no "safe" level of radiation which can damage reproductive cells and lead to genetic mutations and cancer, damage the immune system, cause leukemia and more (World Health Organization) (**0013-5** [Thomas, Ellen])

Comment: U238, has a half-life of 4.5 billion years, the age of our planet. Not to worry, we'll be safe after 10 half-lives, 45 billion years from now. We have thus contaminated Earth forever already, and everyone in this room has some Sr-90 in his or her bones, exposing bone marrow to the risk of leukemias and related malignancies and morbidity (**0015-5** [Richardson, Don])

Comment: the potential for such facilities to pose the threat of severe damage to the environment and to human populations mitigate against the development of nuclear production and delivery services. (**0023-3** [Drake, Joan W.])

Comment: I would not be interested in drinking water or eating fish from the Broad River if I were anywhere downstream of Gaffney. (**0038-7** [Thomas, Ellen])

Comment: Blue Ridge Environmental Defense League opposes this project for a variety of reasons: Harmful radioactive pollution is released into the air and to the water from nuclear power plants on a routine basis. Of course, highly toxic radioactive waste is also stored on site in pools of water. (**0001-9-1** [Zeller, Lou])

Comment: There is great potential for release of radiation into the atmosphere (**0037-3** [Breckheimer, Steve])

Comment: [There is great potential for release of radiation into the ...] water from nuclear plants (**0037-4** [Breckheimer, Steve])

Comment: Our water supply is threatened by the potential for leaking radioactivity from the reactor (documented at dozens of sites today). (**0013-9** [Thomas, Ellen])

Comment: I think of the plant in North Carolina that had to flush out its pipes in the midst of a hurricane, flooding farmlands and pig farms with radioactivity. (**0038-8** [Thomas, Ellen])

***Response**: These comments concern possible health effects from radiation exposure. Chapter 5 of the EIS will address the potential radiation doses and the associated health effects from operation of the proposed Lee Nuclear Station. Impacts related to storage of radioactive waste will be addressed in Chapter 6 of the EIS. Cumulative radiological impacts will be described in Chapter 7. The NRC's regulatory limits for radiological protection are set to protect workers and the public from the harmful health effects of radiation on humans. These radiation standards reflect extensive scientific study by national and international standards-setting organizations, and incorporate conservative assumptions and models to account for differences* *in gender and age to ensure that workers and all members of the public are adequately protected from radiation*.

D.2.2.12 Comments Concerning Accidents – Severe

Comment: The history of production of nuclear energy is replete with accidental threat of radiation exposure to human populations and to the environment (**0023-6** [Drake, Joan W.])

Comment: This location is within 50 miles of some 2.3 million people, including thousands of members of Sierra Club, both in North and South Carolina, who could be impacted by any serious nuclear incident at this facility (**0029-1** [Thomas, Bill])

Comment: And so it's not clean and it's not safe. I mean, anytime, you know, Chernobyl or some Three Mile Island accident could happen. (**0001-19-3** [Richards, Kitty-Katherine])

Comment: And you know what, if the Gulf oil spill has taught us anything, it's taught us that the worst case scenario can happen; it will happen eventually. We've been very lucky in this country that it hasn't happened. This community better get your evacuation plans well in hand and know where you're supposed to go. You better get your iodine pills and be ready. If nothing else, we've learned that complex systems can fail in complex ways that we can't even imagine. (**0001-30-10** [Corbett, Susan])

Comment: Catastrophic consequences of nuclear reactor failure come to mind i.e., Chernobyl and Three-Mile Island. (**0034-3** [Hallock, Judith])

***Response**: The comments concern the potential for severe accidents at the proposed Lee Nuclear Station. The environmental impacts of postulated accidents, including severe accidents, will be addressed in Chapter 5 of the EIS.*

D.2.2.13 Comments Concerning the Uranium Fuel Cycle

Comment: And then we need to disclose about the waste as well, because every form of power that uses fuel makes waste. In the case of uranium fuel, its waste that can cause cancer, birth defects, nobody wants it. And I'll go on record that western North Carolina does not want a granite repository, thank you very much. But I think it's time that the federal regulators that come out and talk to local communities about new waste generation happening in addition - you know, that's why you're going to withdraw all this water, is to cool that core to be sure that the nuclear meltdown doesn't happen. So, good, we're making waste, and so the regulator needs to disclose that the same regulator is considering changes its own regulations to make what is currently 120 years of temporary storage up to 300 years of temporary storage, because there is no plan for what to do with the waste that would be generated at the William States Lee site. So does the local community know that you are being sited with not only a pond and a nuclear

power plant but also a temporary storage site for waste up to 300 years.
(**0001-15-9** [Olsen, Mary])

Comment: there's also the question of waste. If the Lee station goes on line, it will be a high-level nuclear waste dump for the foreseeable future, and that's just the facts.
(**0001-23-3** [Hildebrandt, Lorena])

Comment: I'm worried about the waste. Barnwell is closing in 2038, so the waste that's generated here will not be able to go there after 2038. (**0001-30-5** [Corbett, Susan])

Comment: They've been kicking this nuclear waste can down the road for over half a century. They are no more equipped to deal with it now than they were when they started. They had to commission a blue-ribbon commission to study it again. It's ridiculous.
(**0001-30-7** [Corbett, Susan])

Comment: Nuclear waste is very dangerous, lasts for years and we have no where to store it because of NIMBY. (**0003-6** [Hale, Kendall])

Comment: Nuclear waste remains radioactive for millions of years; we still need effective nuclear waste management (**0013-3** [Thomas, Ellen])

Comment: William States Lee if it goes on-line will be a high-level nuclear waste dump for the foreseeable future. (**0014-5** [Olsen, Mary])

Comment: [Nuclear power …] produces hazardous and long lasting waste.
(**0017-3** [Hicks, Katie])

Comment: The permanent storage of radioactive waste remains unsolved regardless of the passage of federal legislation. (**0021-6** [Barnett, Barbara A.])

Comment: the difficulties entailed in managing toxic waste disposal from such production, all mitigate against the development of nuclear production and delivery services.
(**0023-4** [Drake, Joan W.])

Comment: The history of the production of nuclear energy is replete with extreme difficulty in designing, managing, and securing facilities and effective processes for the disposal of toxic waste. (**0023-7** [Drake, Joan W.])

Comment: There is still no resolution of the issue of safe disposal of long-lived hazardous nuclear waste from reactors in our nation, meaning that radioactive wastes will be stored on site as at other nuclear plants, adding to the hazards of the reactors themselves; and (An NRC study in 1997 calculated a fire in a spent fuel pool could produce 54,000 to 143,000 cancer deaths and would render 2,000 to 70,000 square kilometers of Agricultural Land uninhabitable. (Caldicott, Nuclear Power is not the Answer, p.99-105)) (**0029-2** [Thomas, Bill])

Comment: In the broader picture, I am concerned with nuclear power production related to uranium mining and the high-level nuclear waste production and storage. (**0034-2** [Hallock, Judith])

Comment: There is still no good plan for disposal of the radioactive waste that we already have let alone the waste from additional nuclear facilities. (**0037-2** [Breckheimer, Steve])

Comment: Nuclear power reactors create plutonium which can be used to make bombs. It is one of the most toxic man-made substances known, remaining radioactive for more than 240,000 years (**0013-6** [Thomas, Ellen])

***Response**: These comments concern the disposal of both low- and high-level radioactive waste, and the consequence of closing the Barnwell, South Carolina, low-level radioactive waste disposal facility. The impacts of the uranium fuel cycle, including interim storage and ultimate disposal of spent fuel and other radioactive waste, will be discussed in Chapter 6 of the EIS.*

Comment: Uranium mining does create a lot of pollution in itself, and it's getting harder and harder to mine good stuff, so it costs more and more, and the processing of it, the mining of it, the transportation of it -- it's not clean. Obviously it does have a lot of radioactive waste that we have to deal with for hundreds of thousands of years with deformed children and babies and cancer and all this kind of stuff. (**0001-19-2** [Richards, Kitty-Katherine])

***Response**: The comment concerns the potential for health impacts from radiation exposure from uranium mining. The impacts related to the uranium fuel cycle will be addressed in Chapter 6 of the EIS.*

Comment: And, you know, when President Obama, who has tried to do some good things for the country, you know, I think, but when he keeps saying that nuclear waste is going to be recyclable -- you know, they're going to make sure that they can find a way to do that -- you know, let's keep speaking out and saying, Where's your proof? You know, where have you got this genius scientist that has come up with a way? -- because it's not in existence. (**0001-19-4** [Richards, Kitty-Katherine])

***Response**: The comment concerns the potential for recycling spent nuclear fuel. The potential environmental impacts of the fuel cycle from recycling only the uranium from spent nuclear fuel will be addressed in Chapter 6 of the EIS. Recycling uranium and plutonium from spent nuclear fuel will not be addressed in the EIS. While Federal policy no longer prohibits recycling,* *additional research and development is needed before commercial recycling of spent fuel produced by U.S. nuclear power reactors occurs.*

Comment: There is no reduction in the carbon footprint, as far as I can tell, when we consider the entire life cycle of the project, from construction, permitting, mining, cooling, and disposing of waste. (**0001-20-5** [Bliss, Rachel])

Comment: We came here to talk about Make-Up Pond C, but we're really talking about the environmental impacts of the Lee nuclear plant as well. As we all know, fission -- the fission reaction directly does not involve carbon. A lot of people have been talking about nuclear as a carbon-free alternative, and a lot of people have been talking about that it's not carbon free. The fact is that it's not carbon free. It uses processes that use carbon. (**0001-22-3** [Fair, Gabriel])

Comment: An analysis of the entire nuclear fuel cycle, the entire cycle, from exploration to decommissioning and storage, the whole thing, is highly carbon intensive. It has a huge carbon footprint, but they only count the footprint while they're operating the plant, when they turn the key and operate that -- well, we'll just start counting it -- I mean, if you had a Land Rover and you drove to the top of Pikes Peak in Colorado and coasted into the valley and then looked at your gas mileage, you'd say, Hey, this thing's getting 200 miles to a gallon. Well, that's what the nuclear industry's doing. (**0001-25-2** [Richardson, Don])

Comment: There is no reduction in the carbon footprint when we consider the entire life cycle of the project from construction, mining, cooling and disposing of waste. (**0009-7** [Bliss, Rachel])

Comment: While nuclear plants in operation do not themselves release carbon dioxide or other Greenhouse gases contributing to the scientific expectations of global warming, they are not carbon neutral, as the mining and purification of uranium-derived fuels does produce these gases; (**0029-5** [Thomas, Bill])

Comment: Uranium mining is highly toxic, and so are processing and reprocessing. The reprocessing which nuclear advocates may argue makes it renewable, produce obscenely toxic chemicals along with the electricity, horrific bi-products which somehow must be hidden for hundreds of centuries, or at least until some genius discovers how to harmlessly neutralize radiation and toxic chemicals, which may take a very long time. All of these activities have a serious carbon footprint, so the allegation that nuclear power is clean is untrue. (**0013-7**, **0038-6** [Thomas, Ellen])

***Response**: These comments concern the greenhouse gas emissions of the entire fuel cycle and operation of the proposed Lee Nuclear Station. The impacts of greenhouse gas emissions from the life-cycle of fuel production, construction, operation, and decommissioning of the units will be presented in Chapters 4, 5, and 6, and in an Appendix of the EIS.*

Comment: The study that I am familiar with was written by Jan Willem Storm van Leeuwen, a Dutch engineer, and the late Philip Smith, an American engineer. They concluded that a small amount of net energy can be gotten from nuclear power by using the highest-grade ores. But of course we used the highest-grade ores first, and they're running out.

There may be no net energy using low-grade ores, but the industry keeps alive, because there's support for the spinoff of bomb materials; in other words, the production of things that we can't sanely use. (**0001-25-3** [Richardson, Don])

Comment: But when you think about it, uranium really comes from Russia and Kazakhstan and Canada. The kind of uranium we have in this country is very low grade and requires a lot of enrichment and is expensive and stuff like that; plus they made a huge mess uranium mining out west. (**0001-30-2** [Corbett, Susan])

Comment: Nuclear Power is not renewable. Uranium mining is highly toxic and needs to be imported from foreign countries. Again, creates dependency for the USA (**0003-2** [Hale, Kendall])

Comment: [Uranium is ...] imported from foreign countries. (**0013-8** [Thomas, Ellen])

Comment: Further, an analysis of the entire nuclear cycle, done by Jan Willem Storm van Leeuwen and the late Philip Smith, concluded that a small amount of net energy can be gotten from nukes by using the highest grade ores-which are running out-and that there may be NO net energy from the remaining low-grade ores. (**0015-3** [Richardson, Don])

Comment: Uranium itself is a finite resource like coal and oil, so nuclear power is not a sustainable energy source for the long term, like solar and wind-based energy sources (**0029-4** [Thomas, Bill])

***Response**: These comments concern the availability of uranium to fuel the proposed Lee Nuclear Station. The irretrievable and irreversible commitment of resources, such as uranium, will be addressed in the context of the availability of the resource in Chapter 10 of the EIS.*

D.2.2.14 Comments Concerning Transportation

Comment: The transportation of radioactive materials, fuels and waste, to and from the site is itself a hazardous activity subjecting the surrounding population along the transportation routes to health hazards from any accidents and radiation releases (**0029-3** [Thomas, Bill])

***Response**: The radiological and nonradiological impacts of transporting unirradiated fuel, spent nuclear fuel, and radioactive waste to and from the proposed Lee Nuclear Station and alternative sites will be addressed in Section 6.2 of the EIS.*

D.2.2.15 Comments Concerning Decommissioning

Comment: Where will they decommission this reactor? What will they do with it? Chances are this community will get stuck with it. (**0001-30-6** [Corbett, Susan])

***Response**: Title 10 CFR 50.75 requires the applicant to provide reasonable assurance that funding will be available for decommissioning activities at the time it is needed. The environmental impact of decommissioning a permanently shutdown commercial nuclear power reactor will be discussed in Chapter 6 of the EIS. In addition, NRC staff may consider information from Supplement 1 to NUREG-0586 (NRC 2002), Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, published in 2002, when analyzing the expected impacts of decommissioning.*

D.2.2.16 Comments Concerning Cumulative Impacts

Comment: Duke Power and SCE&G are planning to build a coal-fired plant, Cliffside, and 5 Nuclear Reactors on the Broad River. (**0003-7** [Hale, Kendall])

Comment: As the NRC is aware, Duke already operates five reactors here in SC and several more nearby in NC. In fact, SC is the most nuclear power reliant state in the SE and the 3rd most reliant in the country. Further, a host of nuclear waste and nuclear industrial operations are here in SC. The Savannah River Site near Aiken is the most radioactive Department of Energy site in the nation. The Barnwell nuclear dump is also a radioactive hot spot. Nowhere in the application does it discuss the cumulative impacts of having all these facilities operating in SC. Nor does it discuss the cumulative health impacts to Carolinians. The NRC must address these cumulative impacts to water resources and human health if it is to make a truly informed decision on adding two more reactors into this already radioactive mix.
(**0011-13** [Hancock, Mandy])

Comment:

- The National Environmental Policy Act EXPLICITLY recognizes "truncation" as a key issue when it comes to the potential for federal actions to negatively impact our environment - that the integrated totality of federal activity must be assessed - not just in pieces that exclude the larger picture
- On what basis does the Federal Regulator justify holding a scoping hearing on TWO power plants that are but 1/3 of the projected federally licensed powers plants to be impacting the Broad River? Six power plants: Cliffside, Summer x 3 and William States Lee x 2 are all in licensing actions now. Why is there no process that will assess ALL of those impacts - cumulative, synergistic and additive? (**0014-1** [Olsen, Mary])

Comment: In fact, South Carolina is the most nuclear power reliant state in the Southeast and the third most nuclear-reliant in the country, with about 58% of its electricity produced by nuclear power. Nowhere in the application does it discuss the cumulative impacts of having all these facilities operating nor does it discuss the cumulative health impacts to Carolinians.
(**0030-9** [Barczak, Sara] [Hancock, Mandy])

***Response**: Cumulative impacts result from the combined effects of the proposed action and past, present, and reasonably foreseeable actions, regardless of who takes the actions. The appropriate geographic area and time period for considering cumulative impacts depend on the resource being affected and will be determined for each resource as part of the review team's evaluation. The impacts of building and operating the proposed Lee Nuclear Station on the Broad River and adjacent lands would be added to other known or reasonably foreseeable actions and stressors within the defined geographic area of interest. The results of cumulative impact analyses will be presented in Chapter 7 of the EIS.*

Comment: And the revised report doesn't even consider the future implications of climate change. (**0011-10** [Hancock, Mandy])

***Response**: The cumulative impacts analysis contained in Chapter 7 of the EIS will also include the potential effects of global climate change.*

D.2.2.17 Comments Concerning the Need for Power

Comment: As a high-growth state, South Carolina needs additional safe and reliable electricity. As serving as a member of the delegation of the local county development board, that's one of the big questions: Can we provide infrastructure and electricity for people that are desiring to move to South Carolina to provide jobs for our citizens. (**0001-1-1** [Moss, Dennis Carroll])

Comment: The growing need of energy to power our own world is becoming more and more important every day. The 2234 megawatts of power Lee Nuclear Station will generate can and will go a long way in meeting energy needs of the future. (**0001-13-1** [Boger, Paul])

Comment: If we are to sustain the economic healing of plants devastated by the recession, encourage the expansion of those in other facilities, and attract more new plants and the high-paying jobs that they bring with them, we must have the infrastructure to support their operations. First and foremost on that list of essential infrastructure is energy. Traditional industries like paper, textile, and chemistry are well known for their energy consumption. South Carolina now has significant automotive, aviation and advanced materials operations. All of these industries have fantastic potential for future growth in the state, and all are heavy energy users. As manufacturing companies decide to locate or expand in the state, they will need assurances about the availability and reliability of energy.
(**0001-14-2** [Hopper, Sara])

***Response**: These comments express general support for additions to new electric generating capacity in North Carolina and South Carolina such as the proposed Lee Nuclear Station. However, these comments provide no new information relevant to the environmental review and will not be addressed in the EIS.*

Comment: Further, the NRC needs use updated information to reevaluate Duke's analysis for the new reactors in terms of the need for power given the economic downturn and reduction in demand. (**0011-6** [Hancock, Mandy])

Comment: Additionally, the NRC needs to consider all of Duke's new power plant proposals, such as the new coal unit proposed for the Cliffside plant in North Carolina and how that affects the need for the proposed new reactors. (**0030-4** [Barczak, Sara] [Hancock, Mandy])

Comment: The base load estimates to justify the building of these units is flawed. With a little bit of effort from the government and Duke Power, we could reduce power consumption and avoid having to build two expensive and potentially dangerous power plants.
(**0037-1** [Breckheimer, Steve])

***Response**: Affected states or regions may prepare a need for power evaluation and an assessment of the regional power system for planning or regulatory purposes. In North Carolina and South Carolina, the need for power analysis may also be prepared by a regulated utility company and submitted to a regulatory authority, such as a state Public Utilities Commission (PUC). This analysis, called the Integrated Resource Plan (IRP), contains details on energy efficiency, demand-side management, and peak power reduction strategies, all of which are considered conservation activities. The state PUC also has regulatory authority over issuance of the Certificate of Public Necessity and Convenience, as well as rates and rate recovery regarding the construction and operation of new power plants. Duke submitted its most recent IRP to both North Carolina and South Carolina in September 2011 (ADAMS Accession No. ML11262A205) (Duke 2011), and accounted for the Cliffside Station in out-year capacity and margin projections. When another agency has the regulatory authority over an issue, the NRC defers to that agency's decision. The NRC staff will review the need for power and determine if it is (1) systematic, (2) comprehensive, (3) subject to confirmation, and (4) responsive to forecasting uncertainty. If the need for power evaluation is found to be acceptable, no additional independent NRC review is needed. Need for power will be addressed in Chapter 8 of the EIS and alternative energy supply options will be further evaluated and addressed in Chapter 9. The information provided in these comments will be considered to determine whether it significantly affects the forecast upon which Duke relied for its need for power analysis.*

D.2.2.18 Comments Concerning Alternatives – Energy

Comment: And I understand the local community wants benefits, but I'm here to say that you could get three to four times more benefit through instituting a truly green non-nuclear energy base here. The job numbers are spectacular around the world for the development of non-nuclear renewal energy, and also energy efficiency which is delivered; not just telling people to change their light bulbs but actually going into homes and helping people with stopping the leaks of their insulation, putting in additional -- better windows, better insulation, better light bulbs, upgrading appliances. The whole wad is a number of issues around how we're spending our money, how we're making our jobs and what the quality of life is. (**0001-15-6** [Olsen, Mary])

Comment: Conservation of energy is the best solution to our energy needs. Energy use has decreased in recent years, especially in the Asheville area, and we see, as conservation takes hold -- I don't believe any new plants will be needed. (**0001-20-4** [Bliss, Rachel])

Comment: If we're going to provide new energy plant to meet the needs of the future citizens of South Carolina, we need to consider the needs for renewable energy.
(**0001-22-1** [Fair, Gabriel])

Comment: Ladies and gentlemen, we South Carolinians face a crisis. That crisis is ignorance, ignorance to our need to avert -- or invest, rather, in energy efficiency and alternative sources.

South Carolina is 25th in population but 19th in energy consumption per capita. To put that into perspective, California, which is the most populous state in the Union, is 47th in energy per capita, and yet they still use a lot, but we are using far more per capita. New York, which has the largest city in the country, is 27th. (**0001-24-1** [Swinton, D.C.])

Comment: People often praise nuclear energy on - as our savior from fossil fuels: a clean, efficient source. However, it's nowhere close to efficient and is ridiculously costly.

Both boiling-water reactors and pressurized-water reactors, which is the one that Lee county would be -- or Lee Nuclear Station would be, rather, only run at 33 percent efficiency.

The site would have to tap into other plants in the area for energy in the event of an emergency, increasing the strain on those plants, which also happen to run around 33 percent efficiency. Add on top of that our decrepit electrical transport grid, and you have one big ball of waste -- wasted energy, that is. (**0001-24-4** [Swinton, D.C.])

Comment: Other alternative means of power generation can be brought on line in less time, provide many more construction jobs for many more companies, and are less risky, do not require large taxpayer liability subsidy, and do not hold a threat to my health, your health, and ecological health posed by operation of nuclear plants and centuries or more of storing toxic radioactive waste. (**0001-27-1** [Howarth, Robert F.])

Comment: Another compelling reason for my opposition to any more construction of nuclear power plants is well illustrated by comparing them to other available functional and healthier means of electrical power generation, comparison in terms of EROEI. That a new one for you? That is energy return for energy invested. This comparison reveals that nuclear is number 15 out of 20 candidates that are currently available. There are 15 -- this means that there are 14 available sources more desirable than nuclear energy in terms of overall efficiency. I have a source for that, and it's listed here.

That is -- this overall energy -- this overall efficiency assessment includes and is composed of a whole system consideration from the extraction at the source, processing, construction, operation of the delivery plant, and cost of any subsequent waste handling and/or disposal. (**0001-27-2** [Howarth, Robert F.])

Comment: And what irks me is that right up the road in Greenville we have a perfectly good GE wind turbine plant making huge wind turbines, and right off our coast we have a DOE-certified 4 million watts of offshore wind-power potential, just sitting there waiting for us to use our amazing Charleston port as a staging ground for the eastern coast wind farm.

Why aren't we doing this? They are doing this -- I just drove to Chicago two weeks ago for a nuclear waste summit, and on the way I drove through Lafayette, Illinois -- Indiana. It was amazing. I didn't know it was there; it just suddenly appeared on the horizon. It was hundreds of wind turbines, really as far as the eye could see. And it was in pasture, and there were cows grazing, and it was amazing. They were just turning very slowly. I don't know how much power. I went to go home and Google that; I never figured it out. But they're doing it in other places, and we keep talking about, well, we're going to research this, we're going to research it. We just need to do it.

And the same thing with solar. I mean, we have 300 sunny days in this state, you know? (**0001-30-4** [Corbett, Susan])

Comment: When alternatives exist that would provide energy in safer, cleaner and more sustainable ways, that would provide jobs and leave our children and our children's children a safer, cleaner future, why is nuclear energy even being considered? (**0008-3** [Craig, Anne])

Comment: Conservation of Energy is the best solution to our energy needs. Energy use has decreased in recent years and we see as conservation takes hold, no new plants will be needed. (**0009-4** [Bliss, Rachel])

Comment: If the NRC could be concerned with the pocket books of the American people (probably not your Department either), it would be looking at the economic benefits of production-based-incentives for distributed customer-supplied solar energy so rapidly successful in cloudy Germany, several US municipalities, Ontario, Canada and spreading world-wide. The truth is nuclear energy in its current form is NOT the solution to US sustainable, renewable, clean energy needs. (**0010-7** [Arnason, Deb])

Comment: Utilities in South Carolina have more affordable ways to meet the region's increasing demand for energy while protecting our water resources and tackling global warming. Promoting energy efficiency measures and investing more resources in the region's wind, solar, and bio-energy industries instead of costly new reactors would benefit Duke Energy and offer economic development opportunities for the region, without draining our water resources or pocketbooks. The NRC must evaluate updated information on using a combination of these alternatives that are far less water intensive before allowing Duke Energy to commit billions of dollars, billions of gallons of water, and nearly an entire decade or more to building these reactors when that time and money could be better spent on less risky, more sustainable energy choices. (**0011-3** [Hancock, Mandy])

Comment: Energy efficiency measures preserve our water resources, save consumers money and also pose no health or safety risks to the public. South Carolina utilities have significant resources to tap in these areas as outlined in a recent extensive report, Energy Efficiency in the South, by Georgia Tech and Duke University 1 and our report, Yes We Can: Southern Solutions for a National Renewable Standard. (**0011-4** [Hancock, Mandy])

Comment: Renewable energy technologies, such as solar and wind, do not require extreme manipulation of our precious water resources. The revised Environmental Report still overlooks Duke's excellent wind resources within its service territory. The Clemson University Restoration Institute shows that South Carolina is poised to lead the charge toward renewable offshore wind energy with its high offshore wind capacity and to reap large economic benefits from the manufacture of wind turbines. The NRC must evaluate a combination of energy efficiency, wind, solar, and clean bio-energy sources as a viable alternative to building expensive and risky new reactors. (**0011-5** [Hancock, Mandy])

Comment: When comparing types of energy generation, nuclear power has higher rates of both water withdrawal and consumption than coal and natural gas and far more than renewable energy sources, such as wind and solar. An April 2010 report by the Georgia Institute of Technology and Duke University examined energy efficiency in the South and illustrated ways by which we could substantially reduce our energy needs, while simultaneously reducing our water consumption. According to the report: In the North American Electric Reliability Council (NERC) regions in the South, 8.6 billion gallons of fresh water could be conserved in 2020 (56% of projected growth in cooling water needs) and in 2030 this could grow to 20.1 billion gallons of conserved water (or 45% of projected growth). (**0011-8** [Hancock, Mandy])

Comment: Other alternative means of power generation can be brought on line in less time, provide many more construction jobs for many more companies, are less risky, do not require large taxpayer liability subsidy, and do not hold the threat to my health, your health, and ecological health posed by operation of nuclear plants and centuries of storing toxic radioactive wastes. (**0012-2** [Howarth, Robert F.])

Comment: Meanwhile, cheaper, safer, job-rich and quicker alternatives are already growing exponentially as nuclear power fades away, and none of them is a terrorist target. They're decentralized and thus protected from failure. They are outperforming nukes every day. (**0015-2** [Richardson, Don])

Comment: [Nuclear power …] cannot be built fast enough to be an effective climate solution in the short term. Cheaper, safer, more just alternatives - such as energy efficiency and conservation, solar, and wind - are a wiser investment. (**0017-5** [Hicks, Katie])

Comment: In Western NC we have plentiful opportunities for energy efficiency and conservation, wind, and solar power. There is no need for such an unstable, expensive and water-intensive project. I urge you to investigate all the viable possibilities and not to permit these new reactors. (**0017-7** [Hicks, Katie])

Comment: I also trust current comprehensive energy plans consider new energy generation in balance with reasonable implementation of reductions in energy consumption. Therefore, I encourage regulators to strongly recommend that comprehensive plans for new plants include consideration for incentives to encourage off-peak use, such as a significant reduced rate offering for off-peak residential uses (a profound positive initiative for seniors and other factions of the low income/unemployed facing uncertain economic futures as it reduces residential consumption during peak hours ...). (**0019-3** [Mominee, Katharine N.])

Comment: I am also interested in the direction for renewable resources on the horizon. Rather than wind, is tidal energy under serious investigation? (**0019-4** [Mominee, Katharine N.])

Comment: Nuclear power is a very costly enterprise, in fact, nuclear power would cost twice as much as renewable energy sources , e.g., solar, wind and geothermal power. (**0021-1** [Barnett, Barbara A.])

Comment: The NRC must evaluate these alternatives more thoroughly before allowing Duke Energy to commit the billions of dollars, millions of gallons of water, and nearly an entire decade to building these proposed reactors when that time and money could be better spent on less risky, more sustainable solutions. (**0030-2** [Barczak, Sara] [Hancock, Mandy])

Comment: Duke's Environmental Report overlooks the excellent wind resources within its service territory. The Clemson University Restoration Institute shows that South Carolina is

poised to lead the charge toward renewable offshore wind energy with its high offshore wind capacity and to reap large economic benefits from the manufacture of wind turbines. Wind, solar, clean bio-energy sources, and efficiency should be fully employed before building expensive and risky nuclear reactors. The NRC should evaluate the use of a combination of these energy choices in comparison to the proposed new reactors.
(**0030-3** [Barczak, Sara] [Hancock, Mandy])

Comment: Duke Energy and its utility partners can meet demands using less water-intensive, affordable energy options. When comparing types of energy generation, nuclear power _has higher rates of both water withdrawal and consumption than coal and natural gas and far more than renewable energy sources, such as wind and solar. For example, according to the Department of Energy's National Renewable Energy Laboratory, developing just 1000 MW of wind in neighboring Georgia instead of traditional power plants could save 1628 million gallons of water per year. (**0030-8** [Barczak, Sara] [Hancock, Mandy])

Comment: Why not spend the money on conservation and appropriate alternative energy and invest in a safe future for our children and grandchildren? (**0034-4** [Hallock, Judith])

***Response**: The NRC does not establish or comment on public or private policy regarding electric power supply alternatives, nor does it promote the use of nuclear power as a preferred energy alternative. Decisions regarding which generation sources and alternatives to generation sources to deploy are made by Duke through least-cost planning and integrated resource plans. Additional regulatory purview is provided by bodies such as State energy-planning agencies, PUCs, and through State legislative actions. The discussion of various energy alternatives to the proposed project is pertinent to the extent that an energy alternative must reasonably be expected to meet the need for power as proposed (including the need for baseload power), whether singly or in combination. The alternatives must be technically viable and feasible. Chapter 8 of the EIS will include review of the need for power in the service territory including the impacts of demand-side management and energy efficiency on the load forecast. Chapter 9 will include the no-action alternative (i.e., denial of a COL), energy conservation and efficiency, demand-side management, new generation alternatives, purchased electrical power, alternative energy technologies (including renewable energy such as wind, solar, and biomass), and the combination of alternatives. In addition, NRC staff is cognizant that information representative of current technology must be considered. For acceptable alternatives, the potential for environmental impacts will be assessed against that of the proposed project.*

Comment: To create renewable energy sources, that would use carbon as well; however, the carbon in those is not -- is -- the carbon that is used in the Lee nuclear plant is -- from the start to the finish will be using carbon, and it's risky. (**0001-22-4** [Fair, Gabriel])

Comment: Furthermore, comparison in terms of carbon footprint shows nuclear as having the third highest among these candidates, following only conventional coal and tar sands. It has a huge carbon footprint when you look at the whole ball of wax, the whole picture, which as I said I believe is the honest way to look at it. (**0001-27-3** [Howarth, Robert F.])

Comment: In the current crisis to provide energy to meet our future needs, we demand that utilities utilize technologies to create an energy system that does not devour economic, environmental, and water resources. The inherent power in the Earth's environmental systems along with measures to reduce overall energy demand can provide the energy needed without degrading ecosystems and depleting life-necessary resources. There is an opportunity to do things differently and in smarter, non-radioactive ways. That opportunity must be seized for the sake of our communities and future generations. (**0011-14** [Hancock, Mandy])

Comment: 350 parts per million is considered the safe upper limit of C02 in our atmosphere. We are now at 392. Getting back to 350 means transforming our world. It means building solar arrays instead of coal plants, it means conservation is no longer the last resort, it means planting trees instead of clear-cutting rainforests, it means increasing efficiency and decreasing our waste. Getting to 350 means developing a thousand different solutions-and most of them will demand money. (350.org) (**0016-6** [LeVander, Valerie])

Comment: It is very important that we reduce our dependency on foreign oil as quickly as possible. (**0018-2** [McCall, Pat])

***Response**: The NRC is not involved in establishing energy policy; rather, it regulates the nuclear industry to protect public health and safety within existing policy. As part of its review of COL applications for new nuclear power plants under NEPA, the NRC does evaluate energy alternatives. Chapters 4, 5, 6, and 7 will include a review of the impacts associated with the construction and operation of the proposed Lee Nuclear Station, including an evaluation of carbon-based greenhouse gas emissions. The discussion of alternative energy sources in Chapter 9 of the EIS will describe the potential environmental impacts from alternative energy sources, including estimated emissions of greenhouse gases, and provide an analysis of energy efficiency and renewable energy sources.*

Comment: Well, why would we look to the nuclear industry to create more jobs? It's probably the most job-poor industry in the United States. That's when you start looking at your alternative energies, which are going to hire millions of people. This is a labor-intensive industry. Renewable energy is labor-intensive; nuclear isn't. (**0001-25-6** [Richardson, Don])

Comment: [production-based incentives for distributed customer-supplied solar energy] creates more jobs than you'll ever see from Duke Energy; they can't fill all the jobs in Ontario, and I've been to Gainesville, and I know what they're able to do there. And the economy is just booming there, too. (**0001-6-1** [Arnason, Deb])

***Response**: The NRC does not establish public policy regarding electric power supply alternatives, nor does it promote the use of nuclear power as a preferred energy alternative. Decisions regarding which generation sources and alternatives to generation sources to deploy are made by Duke through least-cost planning and IRPs. The socioeconomic impacts of construction and operation of the proposed Lee Nuclear Station, including both job creation and job retention, will be addressed in Chapters 4 and 5 of the EIS. Job creation and retention for alternative energy technologies will not be addressed in the EIS.*

D.2.2.19 Comments Concerning Alternatives – System Design

Comment: A nuclear plant must have lower thermodynamic efficiency than even a coal-fired or any other fossil-fuel type plant. There's been a lot of concern about coal-fired power plants at Cliffside and elsewhere. That is, if a coal plant and nuke plant produce the same output, electrical, the nuke plant will create about 30 percent more waste heat discharged into the river.

This is because it is impossible to create superheated steam inside a nuclear reactor core using boiling or pressurized water for both moderator and heat transfer. Hot steam from burning coal or oil that turns a turbine in a fossil plant may be heated to nearly 2000 degrees before it gets to the turbine. This is called superheated or dry steam.

The best a nuke can do is much less than a thousand degrees and creates what is called saturated wet steam. So the best possible efficiency for a nuclear plant is about 30 percent lower than in a fossil-fuel plant. What does that mean for the present situation?

Well, in March the New York State Department of Conservation released a draft policy calling for power plants and other facilities that use water for cooling to recycle and reuse water through closed-cycle cooling technology. That rule would affect six nuclear reactors in New York State, which may require some $2 billion investments in order to continue operating. (**0001-9-3** [Zeller, Lou])

***Response**: The Energy Information Administration (EIA) lists the average operating heat rates for the following technologies: coal, natural gas, petroleum, and nuclear. Information available from the EIA website indicates that the coal and nuclear technologies have very similar energy efficiencies as measured by heat rate (i.e., coal [10,378 btu/kwh] and nuclear [10,455 btu/kwh]). However, because fossil-fired plants are capable of running higher turbine inlet pressures, their thermal efficiencies are higher than a nuclear power plant. For example, where a nuclear power plant may operate at 32 percent thermal efficiency, supercritical coal-fired power plants can operate at 40 to 43 percent thermal efficiency, while natural-gas-fired combined-cycle power plants may operate at 57 to 59 percent thermal efficiency. Steam-turbine metallurgy in any cycle configuration is currently limited to approximately 600°C (1112°F) at the turbine inlet. Information regarding alternative system configurations, including alternative cooling* *configurations, will be addressed in Section 9.4 of the EIS. The EIA webpage can be accessed at http://www.eia.doe.gov/cneaf/electricity/epa/epat5p3.html.*

D.2.2.20 Comments Concerning Benefit-Cost Balance

Comment: The Lee Nuclear Station will benefit our state by creating construction jobs, stimulating the local economy through service jobs, provide low-cost, safe, reliable carbon-free electricity to our citizens. (**0001-1-3** [Moss, Dennis Carroll])

Comment: The facility in Cherokee County will bring billions of dollars in investment to our state, create thousands of good-paying jobs for our citizens, produce reliable energy for our businesses, and, importantly, produce it cleanly and safely in a carbon-free manner (**0001-10-5** [Scott, Darrell])

***Response**: These comments express general support for the proposed Lee Nuclear Station and imply that nuclear power plant emissions contain less carbon than other generation alternatives. Emissions from plant construction and operation will be evaluated in Chapters 4 and 5 of the EIS. Emissions from the uranium fuel cycle will be evaluated in Chapter 6. Emissions from power generation alternatives will be evaluated in Chapter 9 of the EIS. Socioeconomic impacts on the local economy through jobs will be discussed in Chapters 4 and 5 of the EIS. Benefits of the proposed project will be discussed in Chapter 10 of the EIS.*

Comment: This site was under construction 30 years ago and subsequently canceled. It was canceled for economic reasons. Duke is currently in a situation where they don't have funding for this site; otherwise they wouldn't be having secret meetings with North Carolina legislators about changing North Carolina law in order to reach into the pockets of their customers in western North Carolina to pay for this thing. So what is the guarantee that you're not looking at a NEPA process where you're going to look at an action alternative that has absolutely no benefit -- high impact and no benefit. That's what it had 30 years ago; that's what it could have now. (**0001-15-4** [Olsen, Mary])

Comment: Providing this plant is not a good way to use money. This is a sink of the ratepayers' money, and it will only invest in a form of energy which is finite and which comes with risks. (**0001-22-2** [Fair, Gabriel])

Comment:

- Why is NRC proceeding with this review when it is CLEAR that Duke is lacking funding for this project? It is reported that Duke is having secret meetings with "leaders" in the NC State legislature -because it must CHANGE NC LAW in order to get the money for this project.

- Duke requires DELEGATED TAXATION for the construction of this site - effectively collecting money from its customers that is not fee for service and will NOT be refunded if the site in Cherokee County is canceled for a second time (**0014-7** [Olsen, Mary])

Comment: Duke Energy wants permission to transfer the cost of building the nuclear power plants to electricity customers BEFORE the plants ever go online. This will increase electricity costs for years to come. And it is not inconceivable that the plant never will go online, as happened in Gaffney with the Cherokee plant in the 1980's. (**0038-4** [Thomas, Ellen])

***Response**: The NRC's responsibility is to regulate the nuclear industry to protect public health and safety within existing policy. The NRC is not involved in establishing the rates paid by customers. Comments regarding funding and electricity rates will not be addressed in the EIS, however, the Benefit-Cost Balance section of Chapter 10 will discuss the costs of preconstruction, construction, and operation of two nuclear units at the Lee site.*

Comment: And they have to use all this federal money, loan guarantees, and this is the thing about these loan guarantees. Yeah, it's a loan. But if they do what they did last time and leave 64 plants unbuilt, when they default this time, you and I are stuck with the bill. If they default, the taxpayer gets stuck, not the investor. (**0001-30-9** [Corbett, Susan])

Comment: Building new nuclear power plants cost 6-8 billion dollars/reactor. With guaranteed government bail-outs; Which means my tax dollars! (**0003-1** [Hale, Kendall])

Comment: Nuclear power is capital intensive and funding is elusive because financial investors find nuclear power a very risky venture, as does the insurance industry who will not indemnify them, therefore, the only alternative is government subsidies. (**0021-2** [Barnett, Barbara A.])

Comment: The cost of nuclear power is high relative to other sustainable technologies when the safety, environmental and legal liability costs are factored in, (as demonstrated by the failure of private investors to fund such plants without government subsidies and liability caps. (**0029-7** [Thomas, Bill])

***Response**: The NRC is not involved in establishing national energy policy, and issues related to the subsidization of nuclear power are outside the scope of the NRC's mission and authority. A description of the benefits and costs of the proposed project will be provided in Chapter 10 of the EIS.*

Comment: You construct Pond C and it never generates any electric power because people rise up in North Carolina and realize that energy efficiency and non-fuel-based energy technologies are the way to go and refuse to pay. (**0001-15-5** [Olsen, Mary])

Comment: So, do we spend billions on this nuclear plant or do we spend billions on saving this planet. (**0016-7** [LeVander, Valerie])

***Response**: Alternatives to the proposed Lee Nuclear Station will be discussed in Chapter 9 of the EIS. Costs will be discussed in Chapter 10 of the EIS.*

Comment: So these are things in scoping that must be considered and weighed along with the construction of that pond. Is any power going to be generated here that might be construed as a benefit versus the very large impacts to this area by creating that pond?
(**0001-15-10** [Olsen, Mary])

Comment: Building another plant may decrease the cost of energy to consumers years down the road, but at what cost? -- the severe alteration of the Broad River via water intake and thermal pollution, creating dead zones of aquatic life; the creation of tons of nuclear waste that only will be stored in South Carolina? (**0001-24-2** [Swinton, D.C.])

Comment: A report released -- the proposed site area cannot sustain these proposed nuclear reactors without enormous strain placed on our rivers, environment, and ratepayers, not to mention the taxpayers' money. Besides the environmental irresponsibility of Duke Energy in proposing nuclear reactors in a drought-prone area, there's fiscal irresponsibility, especially in this recession. (**0001-23-4** [Hildebrandt, Lorena])

Comment: Who is doing the modeling for this project? Are those who are responsible for modeling the feasibility of this project going to also profit if this project is approved?
(**0009-6** [Bliss, Rachel])

Comment: On what basis does the Federal Regulator stand here with a straight face talking about "benefit" to justify "cost" to the Broad River and other aspects of the Piedmont environment? (**0014-6** [Olsen, Mary])

Comment: We urge you to consider the many disadvantages of nuclear energy in your environmental impact assessment. Nuclear power is expensive. (**0017-2** [Hicks, Katie])

***Response**: The costs and benefits of the proposed Lee Nuclear Station will be discussed in Chapter 10 of the EIS.*

Comment: A report released in 2009 revealed the soaring costs of nuclear energy. The economics of nuclear reactors' renaissance or relapse reported that during the previous year, the cost estimates from new generation reactors can range to a high of 30 cents from a low of 8.4 cents per kilowatt-hour. In contrast, energy efficiency costs about 3 cents per kilowatt-hour.
(**0001-23-5** [Hildebrandt, Lorena])

Comment: It's not affordable. They're talking about 20 cents, and they're lying about it. My utility said it's going to cost us 7 cents a kilowatt hour; it's looking more like 20 cents, 25 cents, even, when they get it all built. (**0001-30-8** [Corbett, Susan])

Comment: Stop the proposal of William States Lee Nuclear Power Plant in Gaffney, SC., because:
1. Nuclear Power is Expensive, $6 to $8 billion per reactor; with promised bailouts from our government. (**0013-1** [Thomas, Ellen])

Comment: Another compelling reason for my opposition to any more construction of nuclear power plants is well illustrated by comparing them to other available, functional and healthier means of electrical power generation. Comparison in terms of EROEI, that is Energy Return For Energy Invested, reveals that nuclear is 15th out of 20 candidates (1). EROEI , also known as Net Energy, has been defined as the energy delivered by an energy-obtaining activity compared to the energy required to get it (2). That is, there are 14 sources more desirable than nuclear in terms of overall efficiency. This overall efficiency assessment includes a whole system consideration from the extraction at the source, processing, construction and operation of the delivery plant, and cost of any subsequent waste handling and/or disposal. This I believe is looking at the "whole picture" in the way it really is, in an honest way.
(**0012-4** [Howarth, Robert F.])

Comment: A new series of recent studies have found that the capital costs of new conventional atomic reactors have gotten so high that even before you factor in fuel and operations, you're talking seventeen to twenty-two cents per kilowatt hour-which is two or three times what Americans currently pay for electricity. (Joe Romm, Exclusive Analysis, Part 1: The Staggering Cost of New Nuclear Power, ClimateProgress.org, January 5, 2009) (**0016-3** [LeVander, Valerie])

Comment: The proposed Gaffney nuclear plant as well as other proposed nuclear plants will rob us of much needed capital to fund our shift to clean renewable energy. We have no more time to waste. (**0016-5** [LeVander, Valerie])

***Response**: The NRC does not have authority under the law to ensure that the proposed plant is the least costly alternative to provide energy services under any particular set of assumptions concerning future circumstances. The potential for alternative non-nuclear technologies will be discussed in Chapter 9 of the EIS. The disclosure of the costs of the proposed action will rely on the best available estimate of financial costs with uncertainties noted. Associated costs that cannot be reliably quantified will also be discussed. The estimated overall internal and external benefits, costs, and associated environmental impacts of the proposed project will be addressed in Chapter 10.*

Comment: As an alumna of the UNC-Chapel Hill Gillings School of Public Health, my familiarity with the extraordinary cost burden to taxpayers of the development of nuclear production facilities mitigate against the development of nuclear production and delivery services. (**0023-2** [Drake, Joan W.])

***Response**: The NRC does not have authority under the law to ensure the proposed Lee Nuclear Station is the least costly alternative to provide energy services under any particular set of assumptions concerning future circumstances. This authority and responsibility is most often the role of State regulatory authorities. The potential for alternative non-nuclear technologies will be addressed in Chapter 9 of the EIS. The disclosure of costs of the proposed Lee Nuclear Station will rely on the best available estimate of financial costs with uncertainties noted. Associated costs that cannot be reliably quantified also will be discussed. The estimated overall internal and external benefits, costs, and associated environmental impacts of the proposed project will be addressed in Chapter 10 of the EIS.*

Comment: Nuclear power died of market forces many decades ago but the industry, ever the opportunist for public subsidies, these many years later still keeps insisting that we try again, ignoring the final diagnosis. In my view, the entire industry needs professional help. (**0015-1, 0001-25-5** [Richardson, Don])

Comment: Bottom line: building enough conventional nuclear reactors to eliminate a tenth of the threat of global warming would cost about $8 trillion, not to mention running electricity prices through the roof. You'd need to open a new reactor every two weeks for the next forty years and, as the analyst Joe Romm points out, you'd have to open ten new Yucca Mountains to store the dangerous waste. Meanwhile uranium prices have gone up by a factor of six this decade, because we're running out of the easy-to-find stuff and miners are having to dig deeper. (Bill McKibben, Eaarth,2010) (**0016-4** [LeVander, Valerie])

Comment: The history of the production of nuclear energy energy [sic] is replete with record levels of inordinate public expense (**0023-5** [Drake, Joan W.])

Comment: I believe investing millions of dollars required to bring on line a nuclear power plant is not a good investment. History demonstrates that cost always exceeds initial estimates, financing is dependent on government subsidy in the form of liability insurance, and the 5 to 10 year or more construction time is too long. (**0012-1** [Howarth, Robert F.])

***Response**: Issues related to costs associated with previous projects are outside the scope of the proposed action and will not be addressed in the EIS. The NRC is not involved in establishing national energy policy, and issues related to the subsidization of nuclear power are outside the scope of the NRC's mission and authority. The estimated overall costs and environmental impacts of the proposed project will be addressed in Chapter 10 of the EIS. The* *benefit-cost balance for the project will rely on the best available estimate of project timing and duration, while noting possible uncertainties that may affect those estimates.*

Comment: And I know that the nuclear reactor is more than just one blowout protector away from a meltdown, but it's still a complex system with multiple possibilities of failure, and there is a liability cap on it as well. There's an $11 billion liability cap, I believe, and I saw a recent study that showed that a major accident in a fuel pool could be $500 billion, and you and I, again would pay for that, because there's a liability cap. (**0001-30-11** [Corbett, Susan])

***Response**: The effects of accidents will be considered in both the environmental and safety reviews. Postulated accidents, including design-based and severe accidents, will be addressed in Chapter 5 of the EIS. The estimated overall costs and environmental impacts of the proposed project will be addressed in Chapter 10.*

Comment: We feel that the Lee nuclear site will give Duke a better portfolio to give us inexpensive power that we require to keep people employed in Cherokee County and flexibility to enable that. (**0001-7-2** [Ware, Steve])

***Response**: This comment expresses support for the proposed action. The costs and benefits of the proposed Lee Nuclear Station will be discussed in Chapter 10 of the EIS.*

Comment: Included among our reasons [for opposing this nuclear plant] is this major factor-cost. While others here will speak to important environmental factors such as water, transport, safety, toxicity and storage, we wish to address cost. Why? Because moving to renewable clean energy is going to cost a lot of money. We are going to have to make choices in how we spend our public purse. As many economists, scientists and industry leaders have noted, there will not be enough money to both build expensive nuclear plants and fund research and implementation of non polluting energy sources. (**0016-2** [LeVander, Valerie])

***Response**: Renewable energy resources will be considered in Chapter 9 of the EIS. The NRC does not have authority under its regulations to ensure the proposed Lee Nuclear Station is the least costly alternative to provide energy services under any particular set of assumptions concerning future circumstances. This authority and responsibility is most often the role of State regulatory authorities. Chapter 9 of the EIS will address the potential for alternative non-nuclear technologies to provide the electricity that could be generated by the proposed power plants and their environmental impacts. The benefits and costs of the proposed project will be discussed in Chapter 10 of the EIS.*

Comment: All costs are not included in the industry estimate of $11 billion, e.g., mining of uranium, transportation of uranium, enrichment plants, subsidy for construction, the temporary disposal of waste, the permanent disposal site, monitoring the Lee reactor, indemnifying the plant, dismantling and burial of the reactor. (**0021-3** [Barnett, Barbara A.])

***Response**: The NRC staff will evaluate the environmental impacts of the uranium fuel cycle including the impacts of fuel manufacturing, transportation, and the onsite storage and eventual disposal of spent fuel. The estimated overall costs and environmental impacts of the proposed Lee Nuclear Station project will be addressed in the EIS. The benefit-cost evaluation for the project, which will be included in Chapter 10, will rely on the best available estimates of project timing and duration, while noting possible uncertainties that may affect those estimates.*

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11. ABSTRACT (200 words or less)

This environmental impact statement (EIS) has been prepared in response to an application submitted to the U.S. NRC by Duke Energy Carolinas, LLC (Duke) for two combined construction permits and operating licenses (combined licenses or COLs). The proposed actions requested in Duke's application are (1) NRC issuance of COLs for two nuclear power reactors at the William States Lee III Nuclear Station (Lee Nuclear Station) site in Cherokee County, South Carolina, and (2) U.S. Army Corps of Engineers (USACE) permit action on a Department of the Army individual permit application to perform certain construction activities on the site. The USACE is participating with the NRC in preparing this EIS as a cooperating agency and participates collaboratively on the review team.

This EIS includes the review team's analysis that considers and weighs the environmental impacts of building and operating two new nuclear units at the proposed Lee Nuclear Station site and at alternative sites, and mitigation measures available for reducing or avoiding adverse impacts. The EIS includes the evaluation of the proposed project's impacts on waters of the United States pursuant to Section 404 of the Clean Water Act.

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)

environmental impact statement, EIS, Duke, combined construction permits and operating licenses, combined licenses, COLs, nuclear power reactors, William States Lee III Nuclear Station, Lee Nuclear Station, Cherokee County, South Carolina, U.S. Army Corps of Engineers, USACE, Department of the Army individual permit application, cooperating agency, least environmentally damaging practicable alternative, U.S. Environmental Protection Agency, Section 404(b) of the Clean Water Act, tribes

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