

Photo courtesy of Westinghouse Electric Company

CONSTRUCTION AND OPERATION OF WILLIAM STATES LEE III NUCLEAR STATION UNITS 1 AND 2

Final Environmental Impact Statement Reader's Guide

December 2013

THE LEE NUCLEAR STATION UNITS 1 AND 2 PROJECT

Duke Energy Carolinas, LLC (Duke) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) on December 12, 2007, for combined licenses to construct and operate two new nuclear units (Lee Nuclear Station site) on the site of the former Duke Power Company Cherokee Nuclear Station in Cherokee County, South Carolina. The NRC has reviewed that application.

WHAT IS THIS DOCUMENT?

The NRC has reviewed the application submitted by Duke and prepared a final environmental impact statement for the Lee Nuclear Station Units 1 and 2 project. This document summarizes the impacts of the building and operation of two new nuclear units at the Lee Nuclear Station site as presented in the final environmental impact statement. It also summarizes the cumulative impacts and alternatives evaluated.

WHERE CAN I FIND MORE INFORMATION?

- An electronic version of the entire environmental impact statement can be found on the compact disc included with this summary.
- View an online version at
<http://www.nrc.gov/reactors/new-reactors/col/lee/documents/nrc-2013.html>
- Review a printed copy or compact disc at
 - Cherokee County Public Library at 300 E. Rutledge Street, Gaffney, South Carolina
 - Contact the U.S. Nuclear Regulatory Commission Environmental Project Manager, Patricia Vokoun, at Patricia.Vokoun@nrc.gov

What is Being Proposed and Why?

Duke is seeking approval for building and operating two new reactor units at the Lee Nuclear Station site to provide additional electricity for use in the central and western North Carolina and western South Carolina service areas as well as the wholesale power market. The two new Westinghouse Advanced Passive 1000 (AP1000) pressurized water reactor units would be capable of providing approximately 2234 megawatts of electricity (MWe) of baseload-generating capacity. The new reactors proposed include a closed-cycle, wet-cooling system that uses mechanical draft cooling towers at the Lee Nuclear Plant site in Cherokee County, South Carolina.

The growing population and development in the Duke Energy Carolinas service territories requires additional sources of electricity to meet the anticipated power needs in 2022 and 2024. The building and operation of new nuclear reactors is considered a **major Federal action**.

MAJOR FEDERAL ACTION

- New and continuing projects and programs that may have a significant effect on the environment;
- Requires an environmental impact statement to provide a detailed analysis of potential environmental effects due to the activity.

NATIONAL ENVIRONMENTAL POLICY ACT

The National Environmental Policy Act is a national policy for the environment that establishes the basis for considering environmental issues in the conduct of Federal activities.

The Act requires the following:

- Use a systematic, interdisciplinary approach for decisionmaking on actions that may impact on man's environment.
- Inform and involve the public in the decisionmaking process.
- Consider significant environmental impacts associated with the action.
- Consider alternatives and their impacts on the proposed action.

The environmental impact statement provides the necessary information required under this Act.

Who is Leading the Lee Nuclear Plant Project?

The NRC is the lead Federal agency for granting the combined licenses. The U.S. Army Corps of Engineers is cooperating with the NRC in the preparation of information in a single environmental impact statement for both agencies' decisionmaking process. The license decision from the U.S. Nuclear Regulatory Commission relates to the construction and operation of nuclear power facilities. Permits from the U.S. Army Corps of Engineers are necessary to perform building and operation activities that may affect nearby water bodies. Both agencies must ensure that the **National Environmental Policy Act** process is properly conducted and completed before they can provide approval for this project. Because the reviews necessary for both agencies are similar, having both agencies work together saves time when reviewing an application. Both agencies work together to produce a final **environmental impact statement**, which describes the effects of building and operating new nuclear reactors on the environment.

ENVIRONMENTAL IMPACT STATEMENT

An environmental impact statement is required for any action that may have significant effects on the environment.

An environmental impact statement describes the potential for project effects on the environment and is used to help determine if an action should be permitted.

The NRC staff (including its contractor staff at Pacific Northwest National Laboratory and Idaho National Laboratory) and U.S. Army Corps of Engineers staff reviewed Duke's application and environmental information and collectively determined the environmental impact levels. The NRC staff and the U.S. Army Corps of Engineers staff, and contractor experts are known as the "review team."

A detailed description of how the NRC determines whether to issue a license to Duke is explained in the following sections. After the U.S. Army Corps of Engineers has completed its review, it will issue a Record of Decision.

What is the U.S. Nuclear Regulatory Commission's Process for Issuing a New Reactor License?

Once an application has been accepted, two separate reviews are prepared that address safety and environmental impacts, as shown in Exhibit A below.

Exhibit A shows the complete process for licensing reviews. The final product from the safety review is a safety evaluation report that details reactor design and safety issues. The final product from the environmental review is an environmental impact statement that describes the environmental effects of building and operating a nuclear plant. Both reviews will be addressed in a mandatory hearing in front of the Commissioners of the U.S. Nuclear Regulatory Commission before they make a decision about whether to grant a license. A contested hearing may be held if an outside group has safety or environmental concerns.

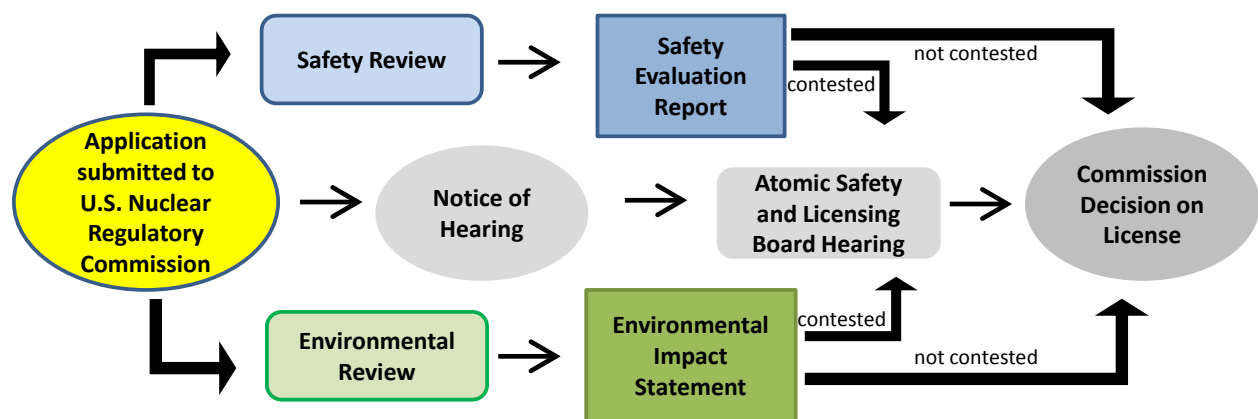


EXHIBIT A. NEW REACTOR LICENSING PROCESS

SAFETY REVIEW PROCESS

The purpose of the safety review is to ensure the new reactors will be safely built and operated according to NRC regulations and requirements. The review includes an evaluation of the design of the facility, siting requirements, quality assurance programs, physical security, and emergency preparedness. Additional information included in the analysis describes radioactive waste management and radiation protection. There are opportunities for public participation during the safety review process. The NRC's analysis is documented in the safety evaluation report.

Duke proposes to use the certified AP1000 advanced passive pressurized water reactor design. Reactors must have documentation that provides information about the engineering design of the reactor; the inspections, tests, and acceptance rules for its safe operation; and a description of how the reactor will connect with other components of the energy system.

The **Advisory Committee on Reactor Safeguards**

reviews each application and the NRC's safety evaluation report (see Exhibit B), and provides advice to the NRC's five-member Commission about the potential hazards for the new nuclear plant and the acceptability of the proposed safety standards.

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

The Advisory Committee on Reactor Safeguards is composed of non-U.S. Nuclear Regulatory Commission technical experts. It is structured so that experts representing many technical areas can provide independent advice to the U.S. Nuclear Regulatory Commission.

Exhibit C shows the steps involved in the safety review process leading up to the mandatory hearing and potential license issuance.

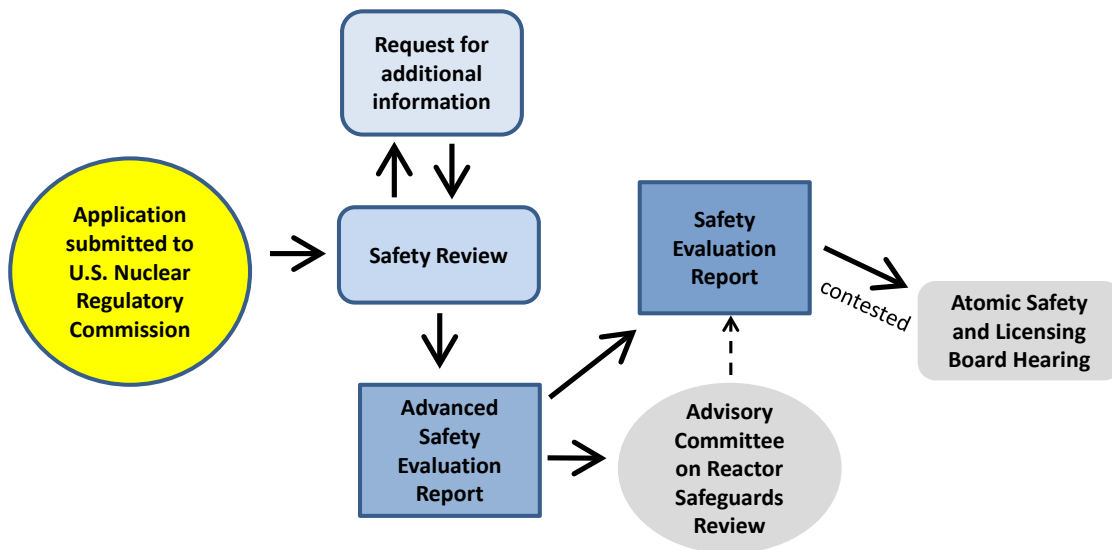


EXHIBIT B. SAFETY REVIEW PROCESS

ENVIRONMENTAL REVIEW PROCESS

The environmental review includes a careful look at the potential environmental impacts of building and operating new nuclear reactors and the potential mitigation measures for reducing environmental effects. The NRC applies the National Environmental Policy Act and the U.S. Nuclear Regulatory's Environmental Standard Review Plan that provides detailed instructions for the review of each environmental subject area (e.g., water, human health, ecology). Environmental effects are explained using descriptions from the **Council on Environmental Quality**.

COUNCIL ON ENVIRONMENTAL QUALITY

The Council coordinates environmental efforts between Federal agencies and the White House offices to develop environmental policies. The Chair of the Council serves as the environmental policy advisor to the President.

The environmental review includes consultation and coordination with local, State, and Federal agencies and Tribal Nations, as well as independent evaluations by the U.S. Nuclear Regulatory Commission and U.S. Army Corps of Engineers, and contractor experts (i.e., the review team). These experts review the applicant's information on the environment; visit and tour the proposed site; request further information from the applicant as needed; review other published studies and reports; and, when necessary, perform additional analyses to confirm the applicant's conclusions. The review team's analysis of the environmental impacts is documented in the environmental impact statement.

In addition, the environmental review includes input from the public by inviting comments before the draft environmental impact statement is prepared, and again after the draft environmental impact statement is issued. Final impacts are categorized as **SMALL, MODERATE, LARGE**, or a range of these categories, which are the accepted descriptions from the Council on Environmental Quality. Exhibit C shows a more detailed process flow for environmental reviews leading up to the mandatory hearing and potential license issuance.

IMPACT CATEGORIES

- **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.

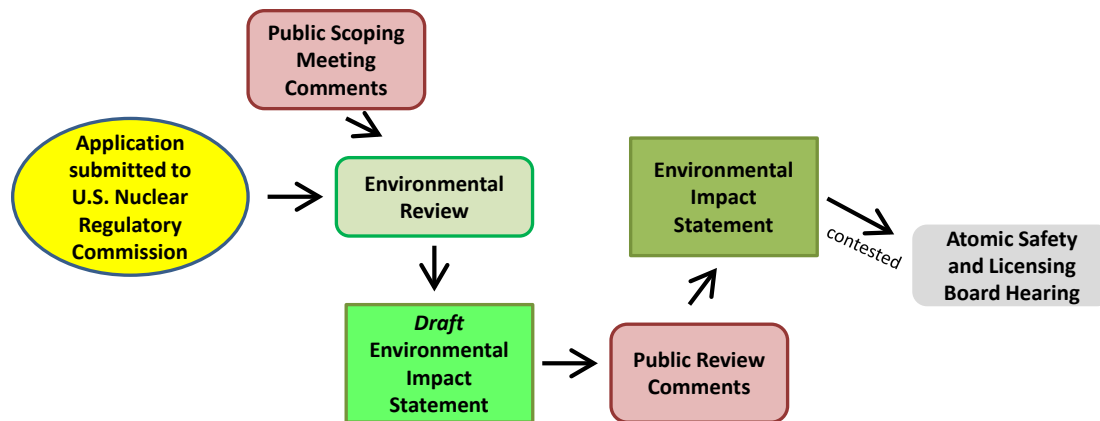


EXHIBIT C. ENVIRONMENTAL REVIEW PROCESS

COMMISSION REVIEW AND DECISION

A mandatory hearing for a combined license is conducted by the Commission. *Combined license* means a combined construction permit and operating license with conditions. An Office of the Secretary document is prepared that summarizes the NRC review team's environmental analyses of granting the combined license for the Commission to use in the mandatory hearing. In addition, a contested hearing may be held by the **Atomic Safety and Licensing Board** panel if an outside party successfully files a petition that raises safety or environmental concerns about licensing the plant. The Atomic Safety and Licensing Board then makes a recommendation to the Commission about whether to grant a combined license.

The NRC's five-member **Commission** makes the final decision about whether or not to grant a combined license.

ATOMIC SAFETY AND LICENSING BOARD

The Atomic Safety and Licensing Board panel are employees of the U.S. Nuclear Regulatory Commission who act as administrative judges on behalf of the Commission. This panel rules over contested public hearings.

THE COMMISSION

The U.S. Nuclear Regulatory Commission has five Commissioners that are selected by presidential appointment. The Commission develops policies and regulations for nuclear reactors and nuclear materials safety, issues licenses, and rules on legal matters.

Who Else Did the U.S. Nuclear Regulatory Commission Work with on This EIS?

A large number of Federal, State of South Carolina and North Carolina, Tribal and local agencies, and community organizations were contacted during the development of the final environmental impact statement. These parties provided comments and information used to develop a good understanding of the environmental resources in the area and the potential for environmental impacts. Detailed information about consultations can be found in Appendix F of the final environmental impact statement.

See Appendix C of the final environmental impact statement for more information about how this project has coordinated with Federal, States of South Carolina and North Carolina, Tribal, and local agencies.

In addition to a combined license from the U.S. Nuclear Regulatory Agency, Duke needs many other environmental permits and authorizations to begin building and operating Lee Nuclear Station Units 1 and 2. Some of these permits are listed in Exhibit D. Appendix H of the final environmental impact statement contains a comprehensive list of all the permits and requirements Duke will need to build and operate new nuclear facilities.

AGENCIES AND TRIBES INVOLVED WITH THIS PROJECT

- Advisory Council on Historic Preservation
- Cherokee County Library
- South Carolina Department of Archives and History, State Historic Preservation Office
- U.S. Fish and Wildlife Service
- National Marine Fisheries Service, Southeast Regional Office
- Catawba Indian Nation
- Eastern Band of Cherokee Indians
- Carolina Indian Heritage Association
- Eastern Shawnee Tribe of Oklahoma
- United South and Eastern Federation of Tribes
- Piedmont American Indian Association, Lower Eastern Cherokee Nation South Carolina
- Pine Hill Indian Community
- North Carolina Wildlife Resources Commission
- Office of Environmental Programs, South Carolina Department of Natural Resources
- City of Gaffney, South Carolina
- Seminole Tribe of Florida
- Natural Heritage Program, North Carolina Department of Environment and Natural Resources
- Heritage Trust Program, South Carolina Department of Natural Resources
- South Carolina Department of Health and Environmental Control
- South Carolina Department of Natural Resources
- Nuclear Response and Emergency Environmental Surveillance, Bureau of Land and Waste Management, South Carolina Department of Health and Environmental Control
- North Carolina Department of Environment and Natural Resources
- U.S. Federal Energy Regulatory Commission
- North Carolina Wildlife Resources Commission, Division of Inland Fisheries
- Cherokee County Sheriff's Office
- Department of the Interior, Office of the Secretary, Office of Environmental Policy and Compliance
- South Carolina Wildlife Federation
- North Carolina Natural Heritage Program
- U.S. Army Corps of Engineers, Charleston District
- U.S. Environmental Protection Agency, Region 4

EXHIBIT D. EXAMPLES OF SOME OF THE PERMITS REQUIRED FOR THE LEE NUCLEAR STATION

Federal level	<ul style="list-style-type: none">• Section 401 Water Quality Certification, South Carolina Department of Health and Environmental Control• Department of the Army Permit, U.S. Army Corps of Engineers• Order for Non-Project Use of Project Lands and Water, Federal Energy Regulatory Commission
State level	<ul style="list-style-type: none">• Compliance with National Historic Preservation Act, South Carolina Department of Archives and History• Consultation concerning potential impacts on state-ranked plant species, South Carolina Department of Natural Resources• National Pollutant Discharge Elimination System Permit, South Carolina Department of Health and Environmental Control• Water Use Permit, South Carolina Department of Health and Environmental Control
Local level	<ul style="list-style-type: none">• Open burning for vegetation/right-of-way clearing approval, Cherokee County• Building Permit, Cherokee County

Description of the Project

The Lee Nuclear Station site is 40 miles southwest of Charlotte, North Carolina, and 8 miles southeast of Gaffney, South Carolina, in north-central South Carolina. The proposed Lee Nuclear Station would be constructed on the approximately 1900-acre site of the incomplete Duke Power Company Cherokee Nuclear Station, which is owned by Duke. Approximately 750 acre of land were disturbed by site-preparation and development activities for Cherokee. In 1978, the NRC granted Duke Power Company permits to construct three reactors at this site. In 1982 and 1983, Duke Power Company canceled the construction of those reactors. The two proposed AP1000 units would generate approximately 1100 megawatts each of electricity that would then be available to the central and western North Carolina and western South Carolina service areas as well as the wholesale power market region. Exhibit E is a conceptual figure of the Lee Nuclear Station on the proposed site.



EXHIBIT E. CONCEPTUAL LAYOUT OF THE LEE NUCLEAR STATION

Parts of the Environment That Might Be Affected

The Lee Nuclear Station site is situated on the south bank of the Broad River, immediately west of Ninety-Nine Islands Dam. The closest community is Gaffney, South Carolina, the county seat of Cherokee County, 8 miles to the northwest of the site. The nearest population center is Gastonia, North Carolina, located 24 miles to the northeast. Water for cooling the reactors would be withdrawn from the nearby Ninety-Nine Islands Reservoir. The drinking-water supply, the demineralized water-treatment system, and water for fire protection, construction activities, and for other minor plant operating systems would be provided by the Draytonville Water District. Exhibit F shows the location of the Lee Nuclear Station site in northwest South Carolina.

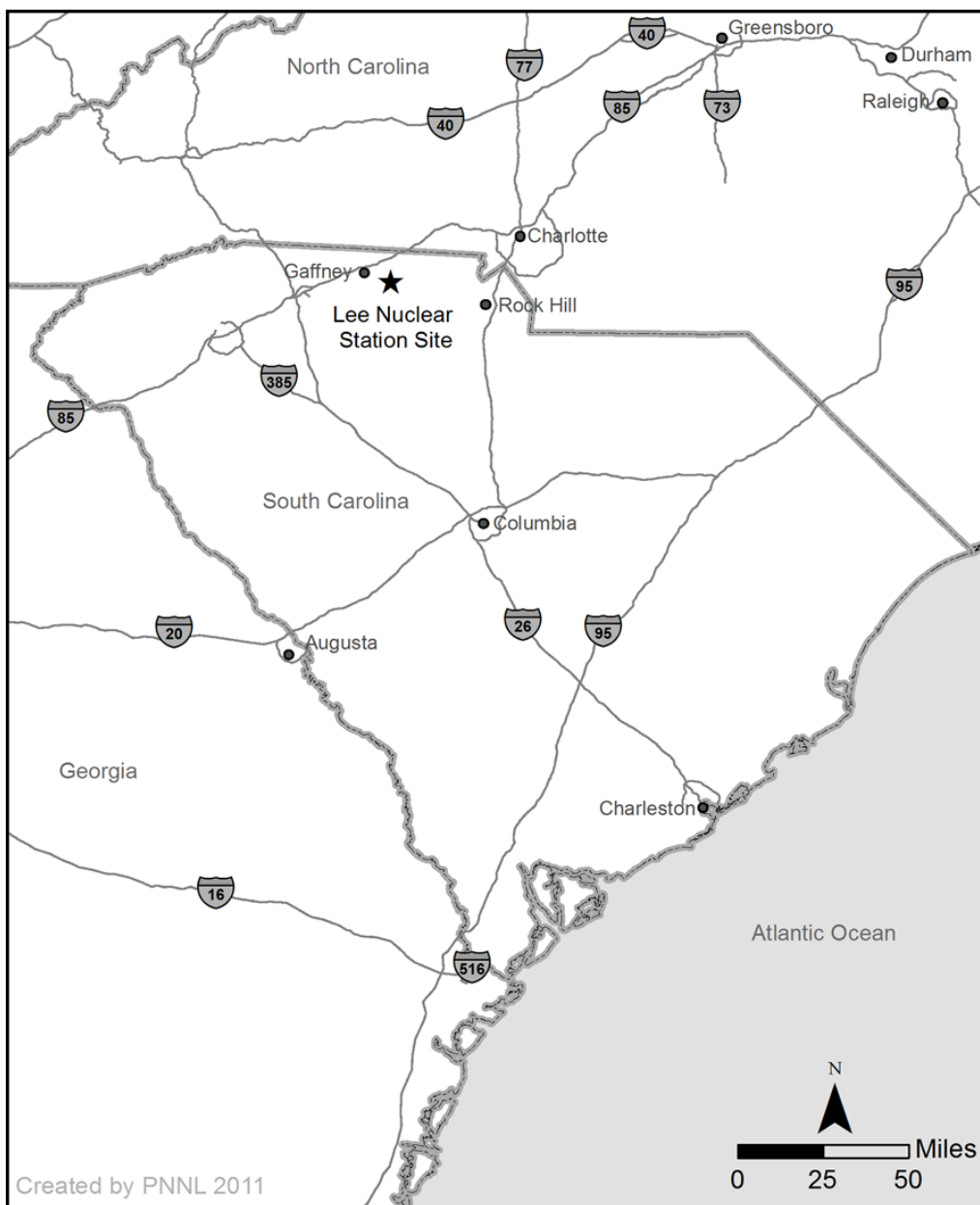


EXHIBIT F. LOCATION OF LEE NUCLEAR STATION

What Are People's Concerns?

To learn about the concerns of interested groups and individuals across the country, public comments were invited for 75 days through a notice in the *Federal Register*, mailings, and news releases on the scope of this project.

Most of the concerns that were within the scope of the environmental impact statement centered on the following issues:

- What is the impact on water availability of adding two more generating units that require such vast amounts of water?
- Is the enticement of jobs a false hope for the area?
- Were other energy alternatives considered for power generation?

PUBLIC PARTICIPATION

- A scoping meeting was held on May 1, 2008, in Gaffney, South Carolina, at the Gaffney High School. All environmental impact statement subjects were discussed.
- A supplemental public scoping meeting was held on June 17, 2010, in Gaffney, South Carolina, at the Restoration Church International. Make-Up Pond C was discussed.
- All scoping comments received and their corresponding responses were included as Appendix D in the final environmental impact statement.
- Two public meetings for comments on the draft Environmental Impact Statement were held on January 19, 2012, in Gaffney, South Carolina, at the Restoration Church International. Comments received and their corresponding responses were included as Appendix E in the final environmental impact statement.

How Does the Project Affect the Environment?

The building and operation of Lee Nuclear Station Units 1 and 2 would have effects on multiple environmental and regional resources. The environmental impact statement considers the potential for impact on each resource.

LAND-USE IMPACTS

The project would make use of a site that has a history of industrial land disturbance, is large enough to accommodate the new facilities without substantial encroachment into environmentally sensitive areas, and does not conflict with zoning or surrounding land uses. However, building an offsite reservoir called Make-Up Pond C required acquisition of approximately 2110 acres of previously undisturbed rural land and long-term termination of agricultural and other rural land uses thereon. Pond C is needed to operate the proposed facilities during severe drought conditions.

Additional land would be affected by building about 31 miles of new transmission lines. New transmission-line corridors would occupy approximately 987 acres of land. The most significant land-use impact from building the transmission lines would be the permanent restriction on structures and timber production within the corridors. Considering the mostly rural setting for

the new transmission lines, the abundance of forestland in that setting, and the ability to build the lines without interfering with most agricultural land use, the review team believes that the effects would not be destabilizing. Other offsite land-use impacts would be limited.

WATER-RELATED IMPACTS

Building the Lee Nuclear Station Units 1 and 2 would alter several bodies of surface water. Building the intake and discharge structures would include dredging in the Broad River and Ninety-Nine Islands Reservoir. Some dredging for removal of sediment would be required for placing the Broad River intake structure and the Make-Up Pond A intake structure. Cofferdam installation, excavation, and filling would be required at the Make-Up Pond B intake structure. While building of Make-Up Pond C is under way, the London Creek flow would be allowed to pass through sediment-settling structures and pipes to downstream of the Make-Up Pond C dam. Upon filling the Make-Up Pond C, Duke would release minimum seasonal flows from Make-Up Pond C to London Creek downstream of the Make-Up Pond C dam that would be protective of downstream aquatic resources. Operation of the cooling-water intake system would withdraw about 4.2 percent of the Broad River's mean annual flow. The majority of water withdrawn would be consumptively used by the proposed Lee Nuclear Station for station cooling, primarily through evaporation.. The intake withdrawal does not include withdrawals associated with refilling Make-Up Pond C when needed.



*Broad River and Ninety-Nine Islands Dam and Reservoir.
(Courtesy of Pacific Northwest National Laboratory)*

There would be no groundwater withdrawal during operation of the proposed Lee Nuclear Station. Wells located near Make-Up Pond C may exhibit increased water levels when that pond is being filled. Similarly, decreased water levels may occur when the pond is used for plant makeup water during droughts. Drawdown events would be infrequent and temporary. Drawdown of Make-Up Pond C would not drop the water table below levels existing prior to initial filling of that pond.

TERRESTRIAL ECOLOGY IMPACTS

The majority of terrestrial ecology impacts result from site-preparation activities. Development of Lee Nuclear Station facilities would require permanent or temporary disturbance or removal of existing vegetation from approximately 49% of the Lee Nuclear Station site. Approximately 585 acres of the estimated 946 acres of total permanent and temporary land disturbance lies within the land previously disturbed for the unfinished Cherokee Nuclear Station project. Impacts would result from clearing, leveling, excavation, and the placement of fill.

Transmission-line corridors would permanently disturb about 690 acres of forest and affect approximately 1.15 acres of jurisdictional wetlands. Make-Up Pond C would impact about 821 acres of forest (of which about 545 acres are mixed hardwood and mixed hardwood-pine forest along London Creek and its tributaries), about 3.55 acres of jurisdictional wetlands, and about 884 linear feet of shoreline vegetation along jurisdictional streams.

The loss of habitat in the immediate vicinity of Make-Up Pond C, especially the removal of lowland mixed hardwood forest along London Creek and its tributaries, and within the transmission-line corridors, especially the removal of forest habitat, would noticeably alter but not destabilize terrestrial and wetland resources. The loss of habitat at Make-Up Pond C would permanently reduce wildlife populations in the London Creek watershed and reduce the functionality of the watershed as a wildlife travel corridor. The loss of upland habitat on the Lee Nuclear Station site would be spatially extensive, but about half of the loss would occur in previously disturbed, low-quality, early-successional habitats. Temporary drawdown of Make-Up Ponds A and B during construction of intake/refill structures could temporarily alter the function of some marginal wetlands. There would also be minimal impacts in the railroad corridor.

Temporary dewatering of wetlands would occur during excavation for installation of the reactor buildings and cooling-water intake and discharge pipelines. There would be no permanent or temporary impacts on jurisdictional wetlands along the Broad River on the Lee Nuclear Station site. Hand-cutting of trees would be necessary within 0.21 acre of a 0.26-acre forested wetland located in uplands just west of the southwest corner of Make-Up Pond A within the 230-kV onsite transmission-line corridor. These wetlands would be permanently converted to

MAKEUP PONDS

The makeup ponds would provide a supplemental water source when the Broad River has low flows during droughts. Make-Up Ponds A and B already exist on the site from the original Cherokee Nuclear Station. In 2007, the Broad River had flows low enough to raise awareness about how severe droughts could affect the Lee Nuclear Station reliability. Make-Up Pond C was proposed to prevent such a decrease in reliability. Exhibit N shows the locations of the water bodies.

scrub-shrub wetlands. This vegetation conversion would be the only permanent impact on jurisdictional wetlands on the Lee Nuclear Station site.

Clearing of vegetation and other site-preparation activities on the Lee Nuclear Station site have the potential to adversely affect wildlife, either through direct harm or by forcing wildlife to move to nearby habitats where they would have to compete with other wildlife for resources. The review team has determined that the site-preparation and development-related impacts of habitat loss and associated wildlife mortality, disturbance, and displacement would be spatially extensive, but allayed somewhat because a substantial portion of the impacts would occur in previously disturbed, low-quality habitat.

AQUATIC ECOLOGY IMPACTS

Aquatic resources in the Broad River and Ninety-Nine Islands Reservoir would be affected mainly by building the new cooling-water intake and discharge systems. The loss of aquatic resources and stream habitat associated with impacts close to Make-Up Pond C, mainly as a result of the impoundment of London Creek to create the supplemental cooling-water reservoir, would noticeably alter but not destabilize aquatic resources. Temporary drawdown of Make-Up Ponds A and B to minimize pressure on cofferdams during construction of intake/refill structures would temporarily alter some habitats. The review team has reviewed the potential impacts of operating the proposed Lee Nuclear Station and the associated Broad River intake system; Make-Up Ponds A, B, and C intake and discharge systems; Broad River discharge system; and transmission-line corridors on aquatic resources. Impingement and entrainment impacts on the aquatic ecology of the site and environs from operation of the Broad River intake structure are likely to be minimal. Impacts on aquatic organisms in the Broad River due to the discharge could result from thermal, chemical, and physical effects on the substrate, and hydrological changes, but were found to be minimal.



Georgia aster in bloom. (Courtesy of National Park Service)

PROTECTED SPECIES

The potential impacts of site preparation and development at the Lee Nuclear Station site, the Make-Up Pond C site, the two new transmission-line corridors, and the railroad-spur corridor are described in the following sections. The Georgia aster (*Symphyotrichum georgianum* [*Aster georgianus*]), a *Federal candidate species*, was observed on or in the vicinity of the project footprint (Make-Up Pond C study area). The U.S. Fish and Wildlife Service concurred that the proposed Lee Nuclear Station Units 1 and 2 project (all elements) is not likely to adversely affect Federally protected species or result in adverse modification of designated or proposed critical habitat.

PROTECTED SPECIES

Species and/or critical habitat that are protected by Federal laws, such as the Endangered Species Act of 1973. If a listed, protected species is found, the Federal agency must consult with either the Fish and Wildlife Service or National Marine Fisheries Service or both to conclude if there is an adverse effect on the species or habitat.

SOCIOECONOMIC IMPACTS

The economic impact area examined included Cherokee and York counties. Most of the physical impacts would be associated with development of the Make-Up Pond C site. Other physical impacts would not be noticeable. Demographic impacts on the communities nearest to the Lee Nuclear Station site would be small and temporary. Building-derived economic and tax revenue impacts on the communities nearest to the Lee Nuclear Station would be minimal.

Physical impacts of operation on workers and the local public, buildings, transportation, and aesthetics would be minimal. Operations workers would constitute a less than 1 percent increase over the baseline population of Cherokee and York Counties. Outage workers would be onsite for approximately 30 days every 18 months per unit. Tax base impacts would be minimal except in Cherokee County where they would be major and beneficial. The operations workforce would be considerably smaller than the building peak employment workforce and would have a minimal impact.

An estimated 70% of the Lee Nuclear Station workforce would come from outside the economic impact area during peak employment. Depending on actual worker relocation patterns, the temporary positive economic and employment impacts in Cherokee County would be noticeable and beneficial and in York County they would be minimal.

The review team concludes that impacts on regional infrastructure and community services, including recreation; housing; water and wastewater facilities; police, fire, and medical facilities; social services; and education would be minimal with one exception. The estimated peak workforce of 4613 during the building period would have a noticeable, but not destabilizing, temporary and adverse impact on traffic on local roads near the site especially on McKowns Mountain Road, and a minimal and adverse impact elsewhere in the region. There is enough capacity for the additional cars attributed to operations at Lee Nuclear Station. During outages, there could be as many as 800 additional workers, increasing traffic and adding congestion on McKowns Mountain Road; however, the staggered shifts make it unlikely that road capacities would be exceeded.

ENVIRONMENTAL JUSTICE IMPACTS

The review team determined there are no environmental, health, or socioeconomic pathways by which the identified minority or low-income populations in the 50-mile region would be likely to suffer disproportionately high and adverse environmental or health impacts as a result of building or operation activities. There are no minority or low-income block groups that reside in the vicinity of the Lee Nuclear Station site. The review team expects that potential adverse socioeconomic impacts from building or operation activities for the new plant would not affect the low-income and minority populations in the region disproportionately because the review team found no evidence of any unique characteristics or practices among those communities that could lead to a disproportionately high and adverse impact. Where there would be potential offsite nonradiological health effects, the review team did not identify any evidence that would indicate any environmental pathway that would physiologically affect minority or low-income populations differently from other segments of the general population during building or operation activities.

HISTORIC AND CULTURAL RESOURCES

Building and operation of a nuclear plant requires looking at the potential for effects on archaeological sites, historic buildings, and traditional places important to local groups. None of the archaeological or architectural resources recorded within defined indirect and direct **Areas of Potential Effect** at the Lee Nuclear Station site or Make-Up Pond C site are National Register-eligible and as a result, building activities on the site and in the vicinity will have no effects on historic properties or traditional cultural resources.

AREAS OF POTENTIAL EFFECT

A geographic area in which an action may change the character or use of a historic property.

Building impacts on historic properties and cultural resources would be negligible with implementation of the Lee Nuclear Station site cultural resources management plan and Memorandum of Agreement between Duke, the South Carolina State Historic Preservation Officer (SHPO), U.S. Army Corps of Engineers, and Catawba Indian Nation. Impacts on historic and cultural resources would be noticeable but not destabilizing within the Make-Up Pond C site upon successful relocation of the Service Family Cemetery.

Impacts on historic properties and cultural resources would be negligible in the transmission-line and railroad-spur corridors with implementation of Duke Energy's corporate procedures to protect known historic and cultural resources, including avoidance of a possible human burial site.

Two of the proposed new transmission-line corridors contain three sites that are potentially eligible for National Register of Historic Places. The South Carolina SHPO concurred that the proposed transmission lines would cause no adverse effects on the two historic farmsteads and no effects on any other historic properties. Distance, topography, and vegetation cover would screen the view from the farmsteads. Any new discoveries found during building or operation activities would involve stopping further work until consultation through the South Carolina State Historic Preservation Office is resolved.

METEOROLOGICAL AND AIR QUALITY IMPACTS

Building activities at the Lee Nuclear Station would result in temporary impacts on local air quality because of emissions associated with ground-clearing activities and use of a concrete batch plant. Release of heat and moisture from operation of the cooling-water system may also affect air quality. Air emissions during operation would primarily be generated by vehicles and the diesel generators. The condensation from the evaporation of heated cooling water may produce visible steam clouds.

Car and truck emissions would vary based on time of day and number of workers driving to and from the nuclear plant, but the overall impact of increased traffic volume and congestion would be localized and temporary.

NONRADIOLOGICAL HEALTH IMPACTS

Nonradiological public health concerns would include exposure to dust and vehicle exhaust, occupational injuries, and noise, electromagnetic fields, and operation of the cooling-water system. Building activities that generate a lot of dust would occur on the site and would be separated from general population exposure. One family cemetery is within 2000 feet of the proposed building site and may be affected by noise from site preparation and development. Recreational activities such as fishing and boating on the Broad River may also be affected by noise during building. During operation, noise levels for plant operation are expected to be minor.

Electromagnetic fields result from the flow of electricity through a transmission line. The immediate impacts of electromagnetic fields, such as electric shock, would be controlled and minimized by placement of the lines. The review team reviewed available scientific literature about the long-term effects of extremely low-frequency electromagnetic fields on human health and found that the scientific evidence regarding the long-term effects of extremely low-frequency electromagnetic fields on human health does not conclusively link such fields to adverse health impacts.

The cooling-water discharge would carry heated water from the nuclear plant diffuser to the Broad River/Ninety-Nine Islands Reservoir, just upstream of the Ninety-Nine Islands Dam. Some harmful bacteria and pathogens may grow in warm waters. Potential health effects on the public and workers from microorganisms that favor warmer water were found to be unlikely.

RADIOLOGICAL HEALTH IMPACTS

Once Units 1 and 2 are operational, the sources of radiation exposure from normal operations for plant workers at the Lee Nuclear Station would include direct radiation exposure and gas and liquid effluent releases. The public, plants, and animals nearby could also receive a radiation dose from the nuclear units through direct exposure, gas effluent releases (breathing or by eating food grown or raised in the vicinity upon which radioactive material dispersed in the atmosphere may have been deposited), and liquid effluent releases (by drinking water or eating aquatic foods where discharged radioactive material became mixed with local surface water and groundwater), as shown in Exhibit G and Exhibit H.

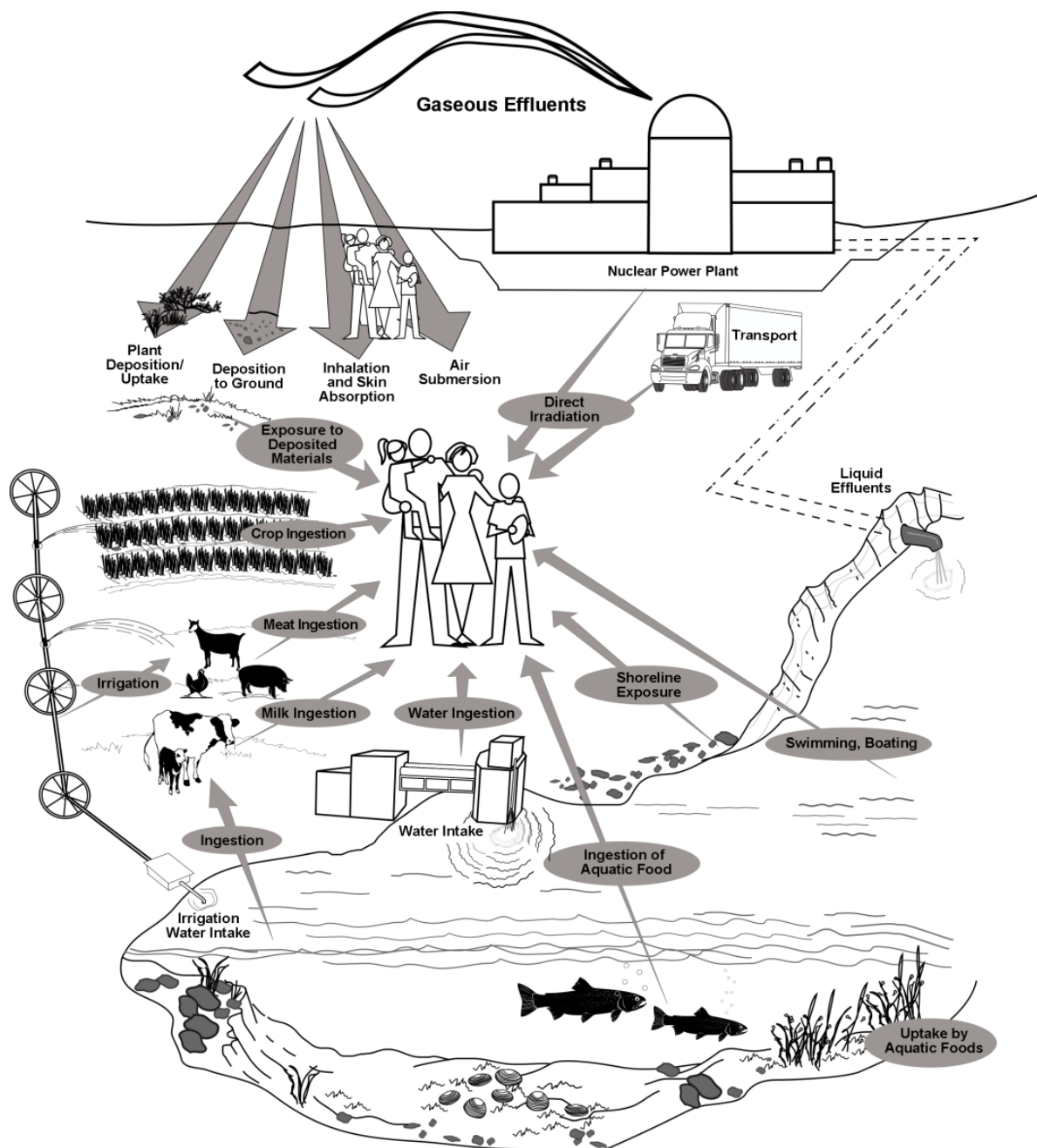


EXHIBIT G. EXPOSURE PATHWAYS TO MAN

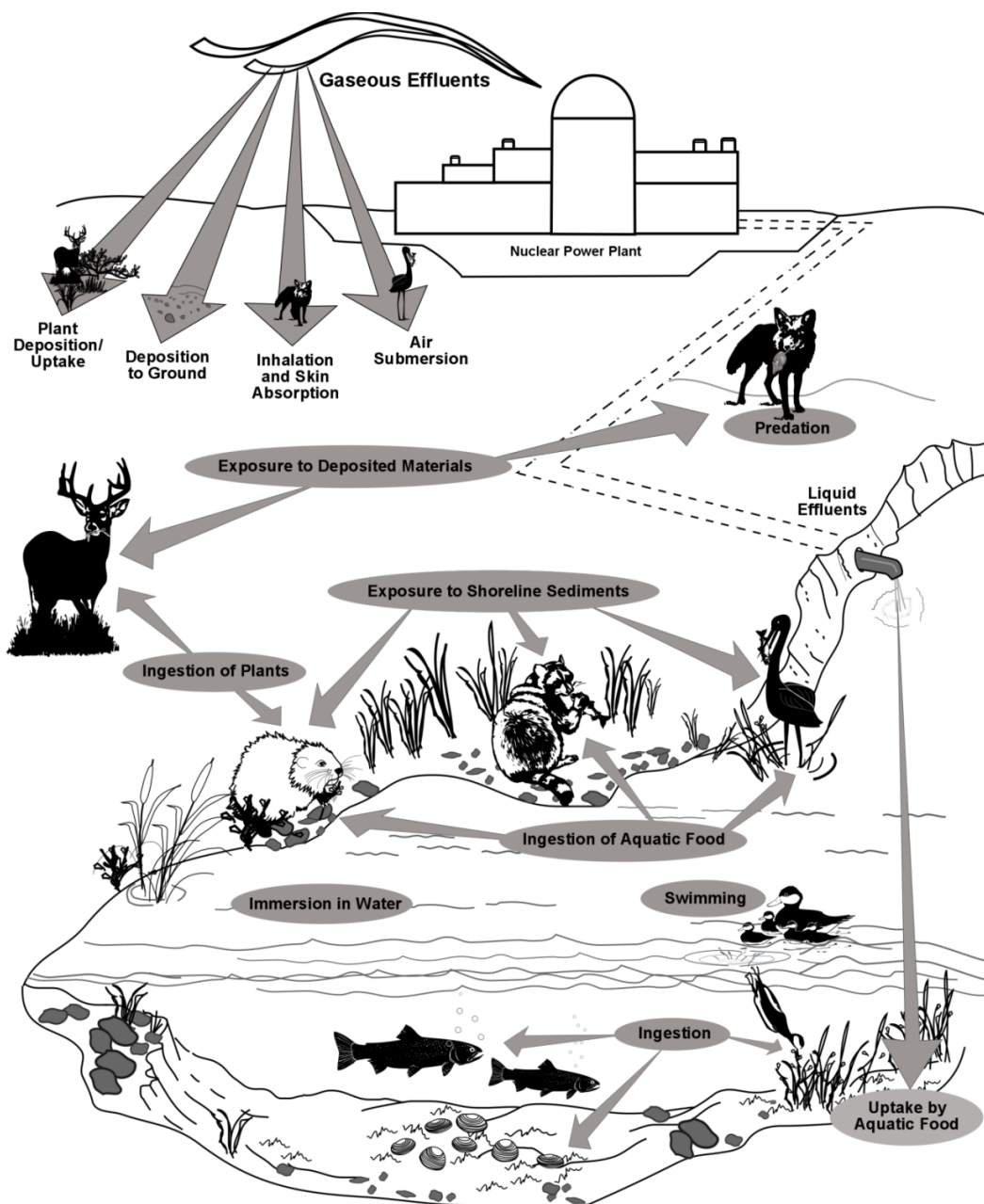


EXHIBIT H. EXPOSURE PATHWAYS TO WILDLIFE AND PLANTS

Contained sources of radiation at the Lee Nuclear Station would be shielded and provide a negligible contribution to the external dose to the population from direct radiation from the containment building and other plant buildings. The maximum total body dose a member of the public might receive within a 50-mile radius of the Lee Nuclear Station would be less than 4 millirem per year (mrem/yr). This amount is approximately 80 times less than the average background radiation one receives in a year, which is 311 mrem/yr. The review team concluded there would be no observable health impacts on the public from normal operation of the proposed new units.

NONRADIOLOGICAL WASTE IMPACTS

Nonradioactive waste that would be generated, handled, and disposed of during building activities include construction debris, dredged spoils, stormwater runoff, municipal and sanitary waste, dust, and air emissions. Spoils generated from dredging the Broad River and Make-Up Ponds A and B for building activities associated with the intake and discharge structures for the new units would be placed in a 10.2-acre upland spoils area at the south end of the Lee Nuclear Station site near McKowns Mountain Road. To reduce the amount of dredged spoils, they would be reused at the Lee Nuclear Station site whenever possible.

Types of nonradioactive waste that would be generated, handled, and disposed of during operational activities include solid wastes, liquid effluents, and air emissions. Solid wastes include municipal waste, sewage-treatment sludge, and industrial wastes. Liquid waste includes discharges such as effluents containing chemicals or biocides, wastewater effluents, site stormwater runoff, and other liquid wastes such as used oils, paints, and solvents that require offsite disposal. In addition, small quantities of hazardous waste and mixed waste (i.e., waste with both hazardous and radioactive characteristics) may be generated during plant operations. Duke would be required to follow all regulations related to gaseous, liquid, and air nonradioactive wastes during building and operations. The review team found the impacts to be minimal based on compliance with State and Federal Regulations.

Exhibit I lists the final impacts associated with the building and operation of Lee Nuclear Station on each resource area.

EXHIBIT I. IMPACTS ON RESOURCES

Resource Category	Building	Operation	Fuel Cycle
Land use	MODERATE (2110 acres disturbed for Make-Up Pond C; 946 acres onsite; 987 acres used for transmission-line corridors)	SMALL	SMALL
Water-related			
Surface-water use	SMALL	SMALL	SMALL
Groundwater use	SMALL	SMALL	SMALL
Surface-water quality	SMALL	SMALL	SMALL
Groundwater quality	SMALL	SMALL	SMALL
Ecology			
Terrestrial and wetland ecosystems	MODERATE (loss of habitat in the vicinity of Make-Up Pond C and transmission line corridors)	SMALL	SMALL

EXHIBIT I. IMPACTS ON RESOURCES (CONTD)

Resource Category	Building	Operation	Fuel Cycle
Aquatic ecosystems	MODERATE (loss of habitat in the vicinity of Make-Up Pond C mainly due to impoundment of London Creek)	SMALL	SMALL
Socioeconomic			
Physical impacts	MODERATE (development of Make-Up Pond C)	SMALL	SMALL
Demography	SMALL	SMALL (beneficial)	SMALL
Economic impacts on the community	SMALL (beneficial; increased revenue)	SMALL to LARGE (beneficial; increased revenue)	SMALL
Infrastructure and community services	MODERATE (traffic on McKowns Mountain Road)	SMALL	SMALL
Environmental justice	SMALL	SMALL	SMALL
Historic and cultural resources	MODERATE (successful relocation of Service Family Cemetery)	SMALL	SMALL
Air quality	SMALL	SMALL	SMALL
Nonradiological health	SMALL	SMALL	SMALL
Radiological health	SMALL	SMALL	SMALL
Nonradiological waste	SMALL	SMALL	SMALL

How Can the Impacts Be Reduced?

Many of the SMALL impacts are considered minimal because monitoring and use of environmental practices and safeguards would reduce any negative effects on an environmental resource. However, some of the impacts greater than SMALL can be reduced or compensated, or prevented from becoming disruptive.

WETLANDS IMPACTS

The proposed construction of Lee Nuclear Station and required additional features, such as Make-Up Pond C, transmission lines, and the railway corridor, would affect 67,285 feet (12.74 miles) of stream, 5.43 acres of wetlands, and 29.63 acres of open waters. Unavoidable impacts on wetlands and streams would be reduced through compensatory mitigation. Duke has consulted with the U.S. Army Corps of Engineers to develop a compensatory mitigation plan. Compensatory stream mitigation would involve the purchase of mitigation credits from a mitigation bank serving the Broad River watershed, a mitigation project at the Sumter National Forest involving the restoration of stream habitat, and a mitigation project involving the preservation and enhancement of high-quality stream resources and associated riparian buffer at the Turkey Creek site.

MEASURES AND CONTROLS TO LIMIT ADVERSE IMPACTS

In its evaluation of potential environmental impacts caused during the building and operation of the proposed Lee Nuclear Station Units 1 and 2, the review team relied on Duke Energy's compliance with the following measures and controls that would limit adverse environmental impacts:

- compliance with applicable Federal, State, and local laws, ordinances, and regulations intended to prevent or minimize adverse environmental impacts (e.g., solid waste management, erosion and sediment control, air emissions, noise control, stormwater management, spill response and cleanup, hazardous material management)
- compliance with applicable Federal and State requirements of permits or licenses required for building and operation of the new units (e.g., Department of the Army Section 404 Permit, National Pollutant Discharge Elimination System permit)
- implementation of best management practices and good construction practices to limit potential impacts
- incorporation of environmental protection requirements into construction contracts.

The review team considered these measures and controls in its evaluation of the impacts of plant building and operation. They are fully analyzed in Sections 4.11 and 5.11 of the environmental impact statement. For every environmental resource area, some kind of coordination with another Federal, State, or local agency is required to gain permission to build and operate the Lee Nuclear Station Units 1 and 2. The required permits and certifications are in Appendix H of the environmental impact statement. Exhibit J provides a summary of planned activities to help minimize environmental effects from building and operating the Lee Nuclear Plant.

EXHIBIT J. SUMMARY OF PLANNED MEASURES AND CONTROLS TO MINIMIZE ENVIRONMENTAL IMPACTS

Resource Area	Impact Minimization Plan
Land Use	<ul style="list-style-type: none">• On the site and in the vicinity, including Make-Up Pond C, limit ground disturbances to the smallest area necessary and within permit requirements, minimize work in wetlands/floodplains/prime farmlands, and minimize potential spills of hazardous wastes/materials through training and rigorous compliance with applicable regulations.• In transmission-line corridors and other offsite areas, locate new corridors to avoid critical or sensitive habitat and species, limit ground-disturbing activities to defined corridors and areas, and minimize impacts via avoidance and compliance with permitting requirements and best management practices (BMPs).
Water-related Impacts	<ul style="list-style-type: none">• For hydrological alterations, install rip rap, stemwalls, etc. to stabilize banks, develop and implement an erosion-control plan, conduct dredging activities in compliance with permits and requirements, dispose of pond dredged material in onsite spoils area, provide makeup water primarily from the Broad River, except during low-flow conditions, prepare and maintain a stormwater pollution prevention plan (SWPPP) and comply with National Pollutant Discharge Elimination System (NPDES) permits, etc.

EXHIBIT J. PLANNED MEASURES AND CONTROLS TO MINIMIZE ENVIRONMENTAL IMPACTS (CONTD)

Resource Area	Impact Minimization Plan
Terrestrial Ecosystems	<ul style="list-style-type: none"> • For water-use and -quality, install/construct cofferdams, settling basins, and/or use other standard engineering controls to protect affected water bodies; install a stormwater drainage system or settling basins at construction site and stabilize disturbed soils; use BMPs during construction to minimize erosion and sedimentation and to minimize the effects of discharging dewatering product to surface water bodies; limit planned effluent discharges in compliance with Clean Water Act regulations, Federal Water Pollution Control Act, and NPDES permit specifications; and prepare and maintain an SWPPP and an NPDES permit to minimize releases. • Conduct land clearing according to Federal and State regulations, permit requirements, Duke Energy's existing construction practices, and established BMPs. • Conduct land clearing to minimize disturbance of vegetation and substrate. • Phase building activities to minimize the duration of soil exposure and implement soil-stabilization measures as quickly as possible after disturbance to minimize erosion and sedimentation. • Obtain and adhere to water-quality certification requirements to avoid, minimize, restore, and/or compensate impacts on wetlands, including development of a mitigation action plan. • Water access roads and cleared areas to attenuate fugitive dust. • Schedule vegetation clearing (including timber harvest) and grubbing, to the extent practicable, to avoid the migratory bird-nesting season. • Locate equipment maintenance in an established yard away from wetlands and waterways. • Locate transmission-line towers such that wetlands and riparian areas are spanned by the conductors. • Avoid environmentally sensitive areas as feasible (e.g., those with "important" habitats or species). • Transplant, if practicable, Federal candidate and State-ranked plant species. • Use drift eliminators to minimize cooling-tower drift. • Document bird mortalities and injuries and disturbances of active nests through the U.S. Fish and Wildlife Service and South Carolina Department of Natural Resources Migratory Bird Depredation Permits.
Aquatic Ecosystems	<ul style="list-style-type: none"> • Develop and implement a site-development SWPPP plan. • Prepare and implement an Spill Prevention, Control, and Countermeasure Plan (SPCCP) for site-development activities. Restrict activities using petroleum products and solvents to designated areas that are equipped with spill containment. • Implement erosion and sediment-control plans that incorporate recognized BMPs. • Install appropriate barriers and use BMPs to protect water bodies and aquatic organisms prior to site-development activities. • Obtain and comply with the Department of the Army permit, State 401 water-quality certification, and BMPs, including development of a mitigation action plan for wetland/stream impacts. • Screen pump inlets to avoid entraining fish and other large aquatic organisms during water diversion and dewatering activities. • Use return systems to deposit impinged fish and other aquatic biota. • Supply makeup water from Make-Up Pond B and Make-Up Pond C during low-flow conditions.

EXHIBIT J. PLANNED MEASURES AND CONTROLS TO MINIMIZE ENVIRONMENTAL IMPACTS (CONTD)

Resource Area	Impact Minimization Plan
	<ul style="list-style-type: none"> Minimize drawdown events and refill makeup ponds as soon as practicable. Treat effluents according to NPDES permit specifications. Use reactors' cooling towers and a closed-loop cooling cycle to significantly reduce the thermal plume effects on aquatic organisms.
Socioeconomics and Environmental Justice	<ul style="list-style-type: none"> Comply with Occupational Safety and Health Administration regulations for worker safety and health. Stagger shifts, encourage carpooling, and schedule deliveries to mitigate shift change or commute times. Allow continued traffic flow during construction of new bridge and approaches for SC 329 alignment, then divert traffic to new alignment once complete. Post signs near construction entrances and exits to make the public aware of potentially high construction traffic areas. Develop a traffic control mitigation plan.
Historic and Cultural Properties	<ul style="list-style-type: none"> Conduct cultural resource surveys, including subsurface sampling and visual impact assessments prior to initiating proposed and future ground-disturbing activities to identify historic properties and cultural resources. Implement the Lee Nuclear Station site cultural resources management plan and Memorandum of Agreement between Duke, the South Carolina State Historic Preservation Officer (SHPO), U.S. Army Corps of Engineers, and Catawba Indian Nation, including procedures to address inadvertent discoveries of potential historic properties or cultural resources. Relocate the Service Family Cemetery from Make-Up Pond C in coordination with the South Carolina SHPO, according to State law, and in cooperation with descendants. Avoid direct physical impacts on sensitive cultural resource located in transmission-line corridor. Avoid direct physical impacts on known historic cemeteries within the boundaries of the Lee Nuclear Station site and maintain public access.
Nonradiological Health	<ul style="list-style-type: none"> Duke would adhere to all Occupational Safety and Health Agency and State safety standards, practices, and procedures
Radiological Health	<ul style="list-style-type: none"> Maintain doses to construction workers below NRC public dose limits. Maintain doses to members of the public below the NRC's and the Environmental Protection Agency's regulatory standards. Maintain occupational doses below NRC standards and ensure implementation of a program to maintain plant worker doses as low as reasonably achievable.
Nonradioactive Waste	<ul style="list-style-type: none"> Handle waste generated during building in accordance with local, State, and Federal requirements. Implement a waste-minimization plan, including beneficial reuse and recycling of building debris. Implement both an SWPPP as required by the State NPDES permit and a SPCCP to reduce impacts from site runoff and spills. Implement operational controls to minimize fugitive dust emissions; implement traffic plans to reduce emissions from vehicles; regularly maintain emissions-generating equipment and operate in accordance with State air quality regulations.

What is the Relationship of This Project with Other Projects in the Area?

Cumulative impacts may result when the environmental effects associated with the proposed action are added to the temporary or permanent effects associated with past, present, and near-future projects. Cumulative impacts can result from the combination of effects that might have been minor by themselves, but become more noticeable when affecting the same resource over a period of time.

A number of projects exist near the Lee Nuclear Station site or are proposed for areas near the site. These projects may be complete or in various stages of development. If project information was available and the project had the potential to contribute to cumulative impacts, it was detailed in the final environmental impact statement. Exhibit K lists projects considered in the cumulative impacts assessment. Exhibit L lists the cumulative impacts of the proposed project.

EXHIBIT K. LIST OF PAST, PRESENT, OR NEAR-FUTURE PROJECTS NEAR THE LEE NUCLEAR STATION SITE

Project Name	Summary of Project
Cherokee Nuclear Station	Uncompleted nuclear power plant
Catawba Nuclear Station Units 1 and 2	Nuclear power plant, two 1129-MW(e) Westinghouse reactors
McGuire Nuclear Station Units 1 and 2	Nuclear power plant, two 1100-MW(e) Westinghouse reactors
Virgil C. Summer Nuclear Station (VCSNS) Unit 1	Nuclear power plant, one 996-MW(e) Westinghouse reactor
VCSNS Units 2 and 3	Nuclear power plant, two 1199.5-MW(e) Westinghouse AP1000 pressurized water reactors, proposed operation in 2016 and 2019
Independent Spent Fuel Storage Installation	Proposed dry spent-fuel storage at the VCSNS site
Carolinas-Virginia Tube Reactor	Experimental pressurized tube heavy water nuclear power reactor – decommissioned
Oconee Nuclear Station, Units 1, 2, and 3	Nuclear power plant, three 846-MW(e) Babcock and Wilcox pressurized water reactors
Westinghouse Fuel Manufacturing Plant	Design and fabricate completed nuclear fuel assemblies and fuel-related products
H.B. Robinson Steam Electric Plant Unit 2	Nuclear power plant, one 710-MW(e) Westinghouse reactor
Nuclear Fuel Services, Inc. Erwin Plant	Prepares high-enriched uranium and fabrics fuel for use in U.S. Department of Energy Naval Reactor Program. Also recovers highly enriched uranium from scrap, and blends highly enriched uranium with natural uranium to produce low-enriched uranium
Columbia Gas Transmission Corporation Grover Compressor Station	Natural-gas compressor station
Broad River Energy Center	Gas-fired power plant, 847 MW

EXHIBIT K. LIST OF PAST, PRESENT, OR NEAR-FUTURE PROJECTS NEAR THE LEE NUCLEAR STATION SITE (CONTD)

Project Name	Summary of Project
Cherokee County Cogeneration	60-MW gas-fired turbine generator, and 26-MW condensing steam turbine generator
Mill Creek Combustion Turbine Station	Gas-fired power plant, 640 MW
Cleveland County Power Plant	Gas-fired power plant, 720 MW
Cliffside Steam Station Unit 6	Coal-fired power plant (clean coal unit), 825 MW
Cliffside Steam Station Unit 5	Coal-fired power plant, 562 MW
Lincoln Combustion	Gas-fired power plant, 1200 MW
Riverbend Steam Station	454-MW coal-fired power plant permanently shut down in March 2013
Various smaller electrical generation plants	35 electrical plants capable of generating <20 MW each
Ninety-Nine Islands Hydroelectric Project	Hydroelectric power plant, 18 MW
Cherokee Falls Hydraulic Turbine	Hydroelectric power plant, 4.3 MW
Gaston Shoals Hydraulic Turbines	Hydroelectric power plant, 6.7 MW
Lockhart Dam	Hydroelectric power plant, 18 MW
Upper Pacolet Hydroelectric Project	Hydroelectric power plant, 0.84 MW
Neal Shoals Hydroelectric Project	Hydroelectric power plant, 4.4 MW
Mining projects adjacent to the Broad River and within 5 miles of the Lee Nuclear Station site	
Thomas Sand Co.	Sand mining
Thomas Sand Co./Blacksburg Plant	Sand and gravel mining
Browns Sand Dredge	Sand and gravel mining
Cunningham Brick/Martin Mine	Clay, ceramic, and refractory minerals
Hanson Brick East/Sericite Pit	Clay, ceramic, and refractory minerals
Industrial Minerals Number 2	Minerals and earths, ground or otherwise treated
Industrial Minerals, Inc.	Miscellaneous nonmetallic minerals
Red Clay-Higgins	Common clay and shale
P&L Erosion/Carroll Dr Mine	Miscellaneous nonmetallic minerals
Transportation Projects	
South Carolina Strategic Corridor System Plan	Strategic system of corridors forming the backbone of the State's transportation system. A planning document exists with no explicit schedules for projects. Includes SC 11 to S 42 near Spartanburg, SC 161 to US 321 through York, SC 72 to S 46 near Chester, US 123 to US 29 mostly to the south of Cherokee County.
ARRA grants to SC Dept. of Transportation	\$5 million for highway infrastructure improvements in Cherokee County

EXHIBIT K. LIST OF PAST, PRESENT, OR NEAR-FUTURE PROJECTS NEAR THE LEE NUCLEAR STATION SITE (CONTD)

Project Name	Summary of Project
Parks, national forests, and historic sites	
Broad Scenic River	The Broad River is classified as a State Scenic River, 15 miles long from Ninety-Nine Islands Dam to confluence with Pacolet River
Kings Mountain State Park	6885 acres with hiking, fishing, and horse trails
Kings Mountain National Military Park	Historic site, hiking
Crowders Mountain State Park	Camping, hiking
Cowpens National Battlefield	Historic battlefield
Sumter National Forest	371,000 acres National Forest
Croft State Natural Area	7054 acres natural area with bike, horse, and hiking trails
Chester State Park	523 acres area for hiking, boating, and fishing
Rose Hill Plantation State Historic Site	44 acres plantation
Water-supply and -treatment facilities on the Broad River and major tributaries	
City of Gaffney/Peoples Creek PLT	Wastewater-treatment facility on the Broad River, permitted flow at discharge pipe 4 million gallons per day (Mgd)
City of Gaffney/Clary Waste Water Treatment Plant	Wastewater-treatment facility on Thicketty Creek (tributary to the Broad River), permitted flow at discharge pipe 5 Mgd
City of Gaffney water supply	Withdrawals up to 18 Mgd from Broad River
Spartanburg Sanitary Sewer District/Town of Cowpens/Pacolet River Wastewater Treatment Plant	Wastewater-treatment facility on the Pacolet River (tributary to the Broad River); permitted flow at discharge pipe 1.5 Mgd
Spartanburg Sanitary Sewer District/ Fairforest Creek Wastewater Treatment Plant	Wastewater-treatment facility that discharges to the Pacolet River and Fairforest Creek; permitted flow at discharge pipe 19 Mgd
Shelby, North Carolina Wastewater Treatment Plant	Discharges to the First Broad River
Shelby, North Carolina water supply	Withdrawals water from the First Broad River
Kings Mountain, North Carolina water supply	Withdrawals water from Kings Mountain Reservoir, upstream of Lee Nuclear Station
Union, South Carolina water supply	Withdrawals water from the Broad River upstream of Lee Nuclear Station
Cleveland County Water Board	Withdrawals water from the First Broad River upstream of Lee Nuclear Station
Cleveland County Water Board	1200 acres proposed reservoir off the First Broad River
Forest City, North Carolina water supply	Withdrawals water from the Second Broad River
Broad River Water Authority	Withdrawals water from the Broad River
Manufacturing facilities within 20 miles	
SC Distributors, Inc.	Fabric mill along Broad River
National Textiles, LLC/Coker International, LLC	Knitwear mill and fabric finishing plant that discharges to the Broad River; permitted flow at discharge pipe 0.0005 Mgd

EXHIBIT K. LIST OF PAST, PRESENT, OR NEAR-FUTURE PROJECTS NEAR THE LEE NUCLEAR STATION SITE (CONTD)

Project Name	Summary of Project
Hanson Brick, Blacksburg Plant	Brick and clay tile manufacturing
Milliken and Co. Magnolia Finishing Plant	Fabric finishing plant that discharges to the Broad River; permitted flow at discharge pipe 3.89 Mgd
Core Molding Technologies, Inc.	Plastics manufacturing
BIC Corporation	Manufactures pens and mechanical pencils
Bommer Industries	Electroplating, plating, polishing, and anodizing metals
Accurate Plating, Inc.	Electroplating, plating, polishing, and anodizing metals
CNA Holdings Inc., Shelby Plant	Manufactures plastics and synthetic resins
Linpac (US Corrugated)	Paperboard mill
Chemetall Foote Corp.	Miscellaneous inorganic chemical manufacturing
Invista SARL / Spartanburg	Plastics materials and resins manufacturing; discharges to the Pacolet River; monitor and report for NPDES compliance
Various minor NPDES wastewater discharges	Various businesses with smaller wastewater dischargers to water bodies
Other Projects	
Future urbanization	Construction of housing units and associated commercial buildings; roads, bridges, and rail; and water and/or wastewater treatment and distribution facilities and associated pipelines as described in local land-use planning documents

EXHIBIT L. COMPARISON OF CUMULATIVE ENVIRONMENTAL IMPACTS BETWEEN PROPOSED SITE AND ALTERNATIVE SITES

Resource Areas	Proposed Site ^(a)	Alternative Sites ^(b)		
	Lee	Perkins	Keowee	Middleton Shoals
Land Use	MODERATE	MODERATE	MODERATE	MODERATE
Surface Water	SMALL to MODERATE	MODERATE	MODERATE	MODERATE
Groundwater	SMALL	SMALL	SMALL	SMALL
Aquatic Ecology	MODERATE	MODERATE	MODERATE	MODERATE
Terrestrial Ecology	MODERATE	MODERATE	MODERATE	MODERATE
Air Quality	SMALL to MODERATE	SMALL to 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)
Environmental Justice	SMALL	SMALL	SMALL	SMALL
Cultural Resources	MODERATE	MODERATE	MODERATE	MODERATE
Nonradiological Health	SMALL	SMALL	SMALL	SMALL
Nonradiological Waste	SMALL	SMALL	SMALL	SMALL
Radiological Health	SMALL	SMALL	SMALL	SMALL

(a) Cumulative impact determinations taken from Table 7-4 in the final environmental impact statement

(b) Cumulative impact determinations taken from Table 9-18 in the final environmental impact statement

DISCUSSION OF IMPACT DIFFERENCES

A few of the environmental resource areas were determined to change from minor effects to more noticeable impacts when considered in combination with other past, present, and near-future projects near the Lee Nuclear Station.

- Surface-water quality – The potential decrease in the future water supply in the Broad River basin is the primary driver of the review team’s change in impact level. However, the cooling-water discharge from the Lee Nuclear Station by itself would have minimal effects.
- Air quality – The national and worldwide cumulative impacts of greenhouse gas emissions have noticeable effects. The proposed Lee Nuclear Station would not significantly contribute to greenhouse gas emissions in the region.

What Alternatives Were Considered?

No ACTION

The no-action alternative would result in the combined licenses not being granted or the U.S. Army Corps of Engineers 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.

ALTERNATIVE SITES

Candidate areas for siting two new nuclear reactors were chosen after considering areas within Duke Energy’s service area 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. Further review of the candidate areas looked at site-specific land-use restrictions, expanding population growth and development avoidance, proximity to transportation, and locations near transmission and load centers. To screen out potential sites, Duke screened further criteria including known hazardous land uses near the site, protected species or habitat, wetlands, and cost considerations. Ultimately, four candidate sites were chosen for additional site suitability analyses, which resulted in the Lee Nuclear Station being chosen as the preferred site, and are shown in Exhibit M. The remaining four sites examined are listed as alternative sites in the final environmental impact statement:

- 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.

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.

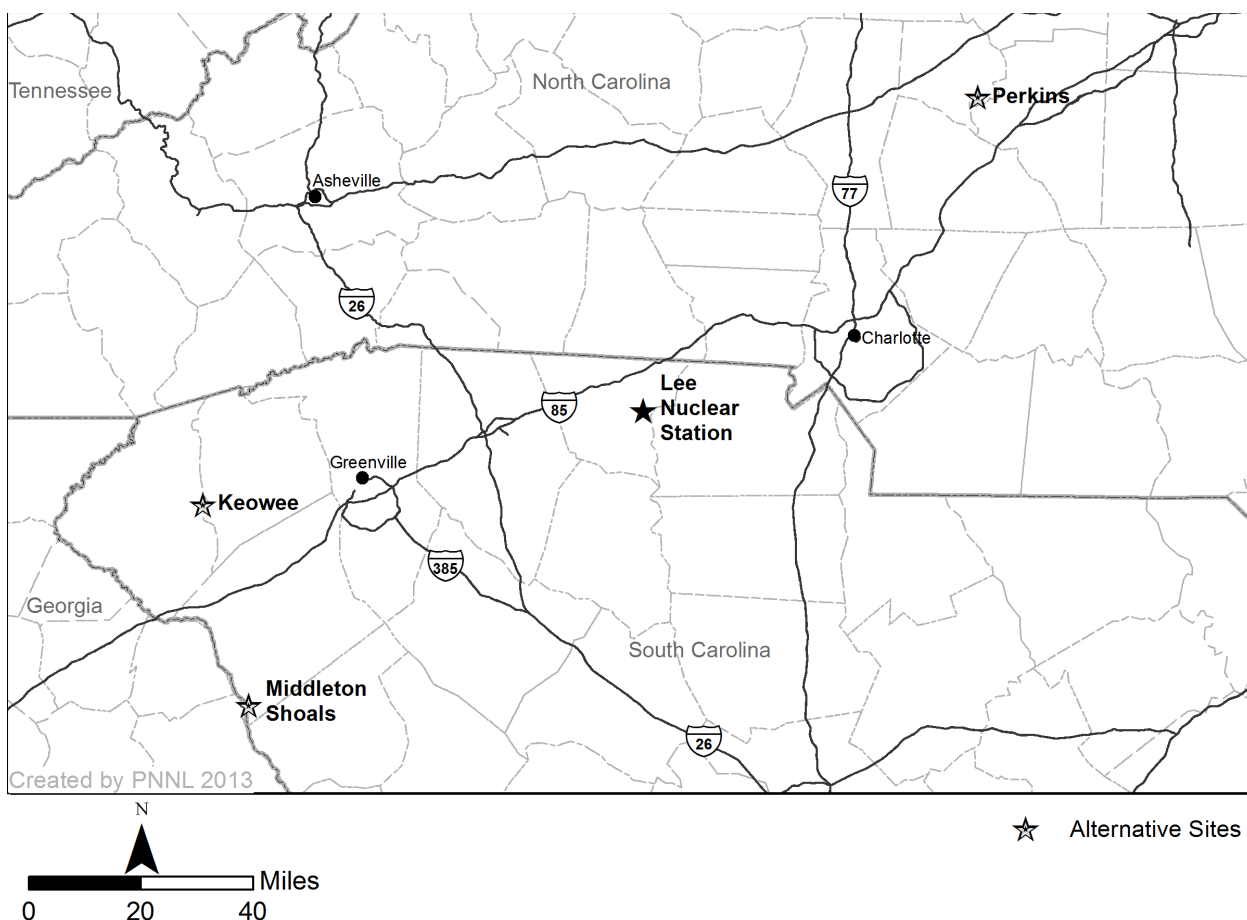


EXHIBIT M. LOCATIONS OF CANDIDATE SITES

ALTERNATIVE ENERGY SOURCES

To compare different types of energy plants with a two-unit nuclear plant, the review team analyzed other power-generation sources, a combination of sources, and power-generation technologies that are technically reasonable and available. The three primary energy sources for generating electric power in the United States are coal, natural gas, and nuclear energy. Coal-fired plants are the primary source of **baseload power** generation in the United States. Natural-gas combined-cycle power-generation plants are often used as intermediate generation sources, but can also be used for baseload power.

BASELOAD POWER

The minimum amount of power that a utility must make available to its customers all of the time.

For the coal-fired generation alternative, the review team assumed the 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 effects of air emissions would be greater for a coal-fired plant than for the Lee Nuclear Station because of the release of carbon dioxide gas and other air pollutants. Coal combustion generates waste in the form of ash. Disposal of the waste could noticeably affect land use, because of the acreage needed, and could affect

groundwater quality. Other environmental effects and cumulative effects would be similar to those described for the Lee Nuclear Station.

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). Air emissions would be similar to those for a coal-fired plant, but in lower amounts. There would be fewer ecological impacts than for a new nuclear facility because less land would be needed. Building a new underground gas pipeline to the site would result in permanent loss of some ecological resources, but the distance to connect to natural-gas distribution systems would be minimal. Other environmental effects and cumulative effects would be similar to those described for the Lee Nuclear Station.

The review team also analyzed a combination of energy sources. Four combined-cycle, natural-gas-fired units would be required to generate the same baseload power as the Lee Nuclear Station, with minor contributions from other existing energy sources such as solar, wind, and energy efficiency programs. This combination of alternatives would have environmental effects similar to natural-gas-fired units.

Renewable energy sources such as wind and solar power were considered, but current technologies for these energy sources are not capable of reasonably producing baseload power similar to the Lee Nuclear Station. With respect to wind energy, more than 2700 wind turbines and 500,000 acres of land would be needed to produce a similar amount of power. Solar thermal technologies would require a large land area of between 11,000 to 26,400 acres of land.

ALTERNATIVE SYSTEM DESIGNS

The review team considered a variety of alternatives for heat-dissipation systems and cooling-water 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's generated heat is converted into electricity. Normal heat-dissipation systems transfer this rejected heat into the atmosphere as evaporation and/or heated discharge water to mix with nearby water bodies. The review team considered seven alternative heat-dissipation systems, but found the proposed mechanical draft wet-tower cooling system to cause the fewest environmental effects. Each tower would be approximately 85 feet high and 360 feet in diameter. An artist rendering of these towers can be seen in the far left and far right of Exhibit F.

Cooling-water systems withdraw water (intake) from the source water body and return a slightly reduced volume of water to the receiving water body at a higher temperature (discharge). One of the main interactions a nuclear power plant has with the environment occurs at the intake and discharge structures. The review team considered three alternative intake and three alternative discharge structures, but found none of the alternatives to be environmentally preferable to the proposed action.

The review team also considered alternative water sources for both the cooling-water and the service-water systems because withdrawal of water for both of these systems has the potential to affect the environment. The proposed cooling-water system is a closed-loop system that relies on evaporative cooling from mechanical draft cooling towers and draws makeup water

from the Broad River via Make-Up Pond A. During periods of low flow in the Broad River, makeup water would be provided from Make-Up Ponds B and C to Make-Up Pond A. The review team considered water reuse from wastewater-treatment plants and the nuclear plant, groundwater, and expansion of Make-Up Pond B, but found none of the alternatives to be environmentally preferable. Exhibit N shows the Lee Nuclear Station site layout with the three makeup ponds and the Broad River.

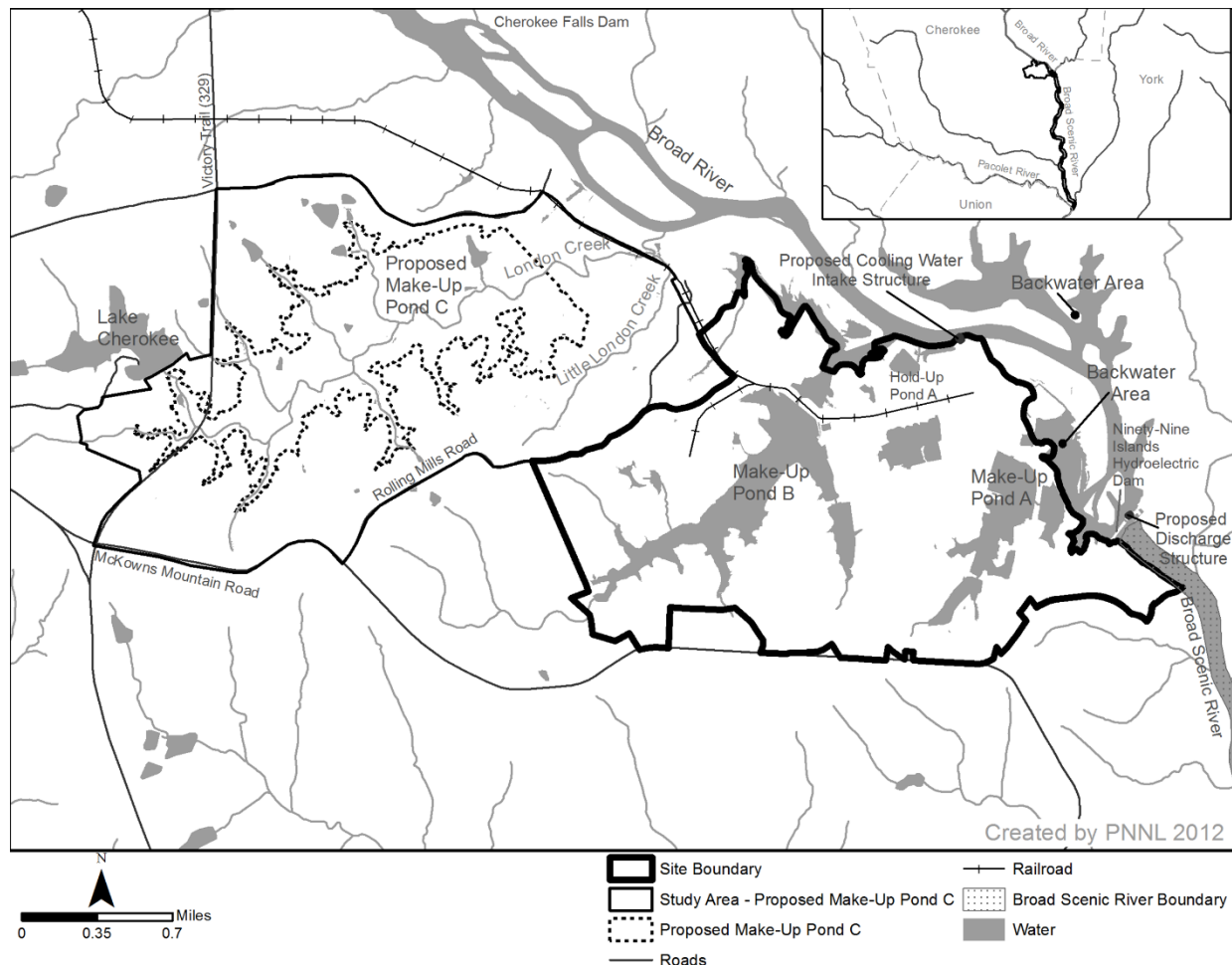


EXHIBIT N. WATER BODIES ON AND NEAR LEE NUCLEAR STATION SITE

What Are the Unavoidable Environmental Impacts?

The National Environmental Policy Act requires that an environmental impact statement include information about any negative environmental effects that cannot be avoided if the nuclear plant is built and operated. These impacts are usually the building activities involved with clearing the land, excavating, filling wetlands, installing roads, and dredging. Exhibit O lists the negative environmental impacts from building and operating the Lee Nuclear Station. The impacts discussed are based on information presented in Tables 10-1 and 10-2 of the environmental impact statement.

EXHIBIT O. UNAVOIDABLE IMPACTS

Environmental Resource		Unavoidable Impact	Impact Level
Land Use		Continued use of approximately 619 acres of land on the Lee Nuclear Station site, approximately 1050 acres of land for Make-Up Pond C, and 987 acres of land for transmission lines.	MODERATE
Water	Use	Groundwater-use effects from filling Make-Up Pond C would be limited to private wells adjacent to the pond. Consumptive use from the Broad River at approximately 3 percent of the mean annual flow.	SMALL
	Quality	Temporary degradation of surface-water quality because of 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. Increased temperature and concentrations of chemicals in cooling-tower blowdown discharged to the Broad River.	SMALL
Ecology	Terrestrial	Noticeable loss of habitat from Make-Up Pond C, inundation of London Creek, and transmission-line corridors.	MODERATE
	Aquatic	Noticeable loss of habitat from Make-Up Pond C and inundation of London Creek.	MODERATE
Socioeconomic	Physical and Aesthetic	Developing Make-Up Pond C would involve clearing forested land, which would negatively affect travelers on SC 329 and residents in the vicinity of the Make-Up Pond C site.	SMALL to MODERATE
	Demography	None	SMALL
	Economic Impact	None	SMALL to LARGE (beneficial)
	Infrastructure and Community Services	Temporary, highly localized periodic traffic impacts during building. Minor increase in traffic at beginning and ends of shifts, especially during outages	SMALL to MODERATE
Environmental Justice		None	SMALL
Historic and Cultural Resources		Inundation of Make-Up Pond C would require relocation of the Service Family Cemetery.	SMALL to MODERATE
Meteorology and Air Quality		Minor amounts of dust emissions, increased car and truck emissions, cooling-tower plumes, increased salt deposition, and increase in criteria pollutants.	SMALL
Nonradiological Health		Minimal impacts from noise, occupational injuries, traffic accidents, disease-causing agents, and electromagnetic fields.	SMALL
Radiological Health		Small radiation doses to public but still below background dose and as low as reasonably achievable doses to workers.	SMALL
Nonradioactive Waste		Small quantities of construction debris, hazardous wastes, permitted effluents, stormwater discharges, and dust and air emissions.	SMALL

What Are the Irreversible and Irretrievable Commitments of Resources?

The term “irreversible commitments of resources” refers to environmental resources that would be permanently changed and could not be restored at some later time by the building or operation activities authorized by the U.S. Nuclear Regulatory Commission and U.S. Army Corps of Engineers permitting and licensing decisions. Exhibit P lists the irreversible environmental resources from building and operating the Lee Nuclear Station. The term “irretrievable commitments of resources” refers to environmental resources that would be used or consumed by the new units in such a way that they could not be recycled or restored for other uses. The review team expects that the use of building materials in the quantities needed for the Lee Nuclear Station would be irretrievable, but would be of small significance with respect to the availability of such resources.

EXHIBIT P. IRREVERSIBLE COMMITMENTS

Environmental Resource	Irreversible Commitment
Land Use	Land committed to the disposal of radioactive and nonradioactive wastes is committed to that use and cannot be used for other purposes
Water Use	Approximately 24,638 gallons per minute of cooling water would be lost from the water systems through consumptive use during operation
Terrestrial Biota	Habitat loss at Make-Up Pond C and London Creek watershed
Aquatic Biota	Habitat loss at Make-Up Pond C and London Creek watershed
Socioeconomics	No irreversible socioeconomic commitments
Historic and Cultural Resources	Relocation of Service Family Cemetery prior to impoundment of London Creek and inundation of Make-Up Pond C area
Air Quality	No irreversible commitments to air quality

What Did the U.S. Nuclear Regulatory Commission Decide?

After considering the environmental aspects of the proposed action, the review team recommended to the Commission that the combined license be issued as proposed.

This recommendation was determined using the criteria in Exhibit Q.

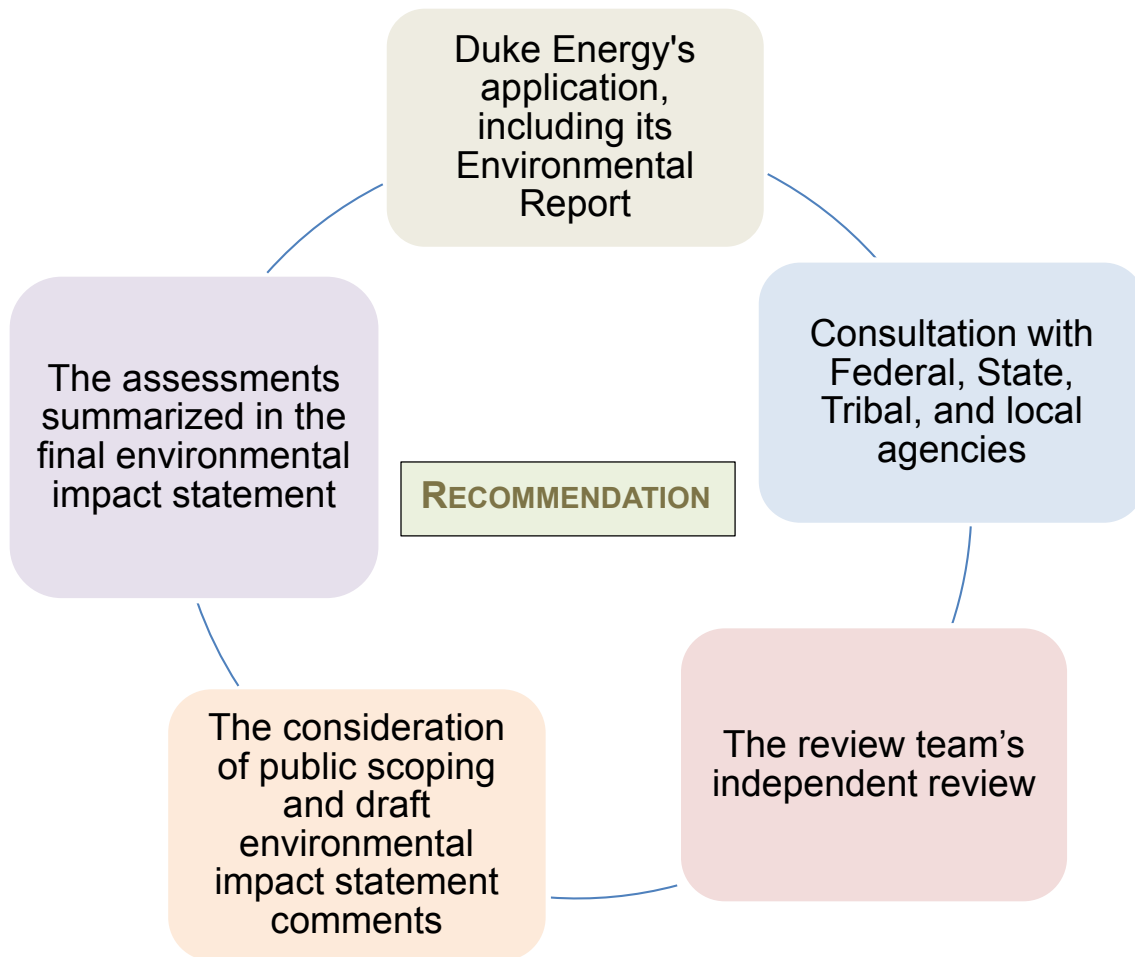


EXHIBIT Q. BASIS OF THE REVIEW TEAM'S RECOMMENDATION

What is in the Environmental Impact Statement?

CHAPTER 1 – INTRODUCTION

This introductory chapter defines the proposed action and the purpose of and need for the proposed action and provides a brief outline of the NRC and U.S. Army Corps of Engineers environmental review processes.

CHAPTER 2 – AFFECTED ENVIRONMENT

This chapter describes the location of the Lee Nuclear Station and the existing conditions at the site and surrounding area and provides the “baseline” for the analysis.

CHAPTER 3 – SITE LAYOUT AND PLANT DESIGN

This chapter describes the proposed site layout and the key plant characteristics that are used for the impact analysis of the proposed actions.

CHAPTER 4 – ENVIRONMENTAL IMPACTS OF CONSTRUCTION

This chapter describes the potential impacts from building the Lee Nuclear Station and the safeguards and controls that would limit the adverse impacts of building the new units.

CHAPTER 5 – ENVIRONMENTAL IMPACTS OF OPERATION

This chapter examines the potential impacts from operating Lee Nuclear Station and the safeguards and controls that would limit the adverse impacts during operation over the 40-year license period.

CHAPTER 6 – FUEL CYCLE, TRANSPORTATION, AND DECOMMISSIONING

This chapter 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 Lee Nuclear Station.

CHAPTER 7 – CUMULATIVE IMPACTS

This chapter describes the cumulative impacts that may result when the effects of building and operating the Lee Nuclear Station are added to, or interact with, other past, present, and reasonably foreseeable future actions on the same resources.

CHAPTER 8 – NEED FOR POWER

This chapter discusses the staff’s evaluation of the need for baseload-generating capacity within the region of interest.

CHAPTER 9 – ALTERNATIVES

This chapter contains the evaluation of energy alternatives, site location alternatives, and nuclear plant design alternatives.

CHAPTER 10 – CONCLUSIONS AND RECOMMENDATIONS

The final chapter provides the staff's preliminary recommendation whether the combined licenses should be issued to Duke.

What Are the Next Steps?

The draft environmental impact statement comment period closed on March 6, 2012. A mandatory hearing with the Commission will be held after the final safety evaluation report is published. As of the publication of this Reader's Guide, the Advisory Committee on Reactor Safeguards is expected to conclude the review of the advanced final safety evaluation report in September 2015. Publication of the final safety evaluation report is scheduled for December 2015, as is the U.S. Army Corps of Engineers' Record of Decision. For additional information, please contact Patricia Vokoun, Environmental Project Manager, at patricia.vokoun@nrc.gov or visit the Nuclear Regulatory Commission's Lee Nuclear Station website.



(Courtesy of NRC Flickr)



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