ENVIRONMENTAL CRITIQUE

Evaluation of Environmental Impacts
Proposals for
Federal Loan Guarantees for Nuclear Power Facilities

Loan Guarantee Program Office
U.S. Department of Energy
April 2009

EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) has determined that six applications for Federal loan guarantees for nuclear power facilities submitted in response to DOE's June 30, 2008 solicitation issued pursuant to Title XVII of the Energy Policy Act of 2005, 22 U.S.C. 16511-16514 (Title XVII) are in the competitive range for further evaluation.

These proposed nuclear power projects are:

- Lee Nuclear Station (Cherokee County, South Carolina)
- Virgil C. Summer Nuclear Site Units 2 and 3 (Fairfield County, South Carolina)
- Vogtle Nuclear Site Units 3 and 4 (Burke County, Georgia)
- Calvert Cliffs Unit 3 (Calvert County, Maryland)
- South Texas Project Units 3 and 4 (Matagorda County, Texas)
- Comanche Peak Nuclear Power Plant Units 3 and 4 (Somervell County, Texas)

All of the proposed projects involve constructing and operating new reactors at existing nuclear power facilities; none of them are at greenfield sites.

This Environmental Critique (EC) provides a comparative assessment of the potential environmental impacts associated with these proposals based on an independent review of the representations and data contained within the applications. Only the areas where substantial differences exist are included in this summary.

The main findings of the EC were the following:

- Transmission Line Corridors

The greatest difference in site-specific impacts of the proposed projects is the extent of new transmission line corridors that will be required.

PLANT	MILES NEW TRANSMISSION CORRIDOR[1]
VCSNS	177
Vogtle	60
Comanche Peak	62
Lee	24
South Texas Plant	None[2]
Calvert Cliffs	None

All ERs indicate that any environmental impacts would be mitigated as a result of consultation with resource and regulatory agencies once a detailed route is developed. Nevertheless, having extensive new transmission corridor requirements adds some

[1] New corridor required outside plant site boundary; some have two or more lines in the same corridor.
[2] Two existing transmission lines will be upgraded over an existing 20 mile right of way

uncertainty to a current assessment of environmental impacts and could potentially create delays in these projects.

- Water Availability

Most affected is the Lee plant (Duke Power), where the ER indicates that water availability from the Broad River might be exceeded during drought conditions once every 12.1 years, potentially curtailing station operations.

The ER for South Texas Project projected small to moderate impacts on groundwater use, but did not discuss them in detail. Site planners are currently evaluating the possibility of additional groundwater sources. For the time being, the environmental impact related to this situation is uncertain.

- NRC Permitting

No environmental impacts were identified related to reactor design; however, the fact that the Westinghouse Advanced Passive (AP)1000 (and the GE (Toshiba) ABWR (Advanced Boiling Water Reactor) have received NRC design certification means there is less uncertainty regarding potential environmental impact (and therefore less risk of delay) related to reactor design for projects using these technologies (Lee, VCSNS, Vogtle – AP1000, and South Texas – ABWR).

The Vogtle project has already received an NRC Early Site Permit (ESP) and a Final EIS has been completed for the permit, which eliminates the need to consider site-specific impacts and alternative sites in the licensing EIS. Having a final EIS also reduces uncertainty about the characterization of environmental impacts and the timing of the overall NEPA process.

- Avoided Greenhouse Gas (GHG) and Air Pollution Emissions

All six proposed plants are expected to avoid CO2 and air pollution emissions that would occur if fossil sources were used for baseload electricity generation instead of nuclear (see figure below). As the table shows, there are two different ways of looking at CO2, NOx, and SO2 reduction at each plant: (1) the avoided emission *rate,* i.e., pounds of emissions avoided per megawatt hour; and (2) the *total tons of emissions avoided per year.* The relative ranking of the six plants may vary depending on which measure is used.

The results for avoided emission *rates* vary primarily with the regional mix of marginal units in each of the three NERC (North American Electric Reliability Council) regions, i.e., the proportion of power which would come from coal and gas. While all six projects would displace a mix of coal and gas fired generation, the greater use of coal in the [redacted] results in a higher avoided emissions rate for CO2,

SO2 and NOx for [redacted] which all have the same rate, are next, and the lowest rates are for [redacted]

On the other hand, the results for the *total tons* of emissions avoided not only reflects the displacement of coal and natural gas in each NERC (North American Electric Reliability Council) region, but is also influenced by the relative size of the plants. Using this measure, [redacted], which had the lowest CO2 avoided *rate*, had the largest total CO2 avoidance. [redacted] were next providing nearly identical total CO2 avoidance amounts. [redacted] had a total CO2 avoidance volume somewhat greater than [redacted] which had the lowest total annual CO2 emissions avoided despite having the highest avoidance rate.

The ranking of the six projects for total tons of SO2 avoided is the same as the ranking for the avoided emission rate, despite the relatively smaller size of the [redacted] plant. The ranking for total tons of NOx avoided differs somewhat from the avoided emissions rate, with [redacted] in the lead, followed closely by [redacted] and [redacted] last. It should be noted that projections of both the avoided emissions rate and total tons of avoided NOx and SO_2 are more variable than those for CO_2, due to variability in the controls on NOx and SO_2. The projections are likely to change over time as NOx and SO2 controls become more stringent in all regions.

Plant Name	Annual Generation MW/h	Avoided C02 Emission Rate lb/MWh	Avoided NOx Emission Rate lb/MWh	Avoided SOx Emission Rate lb/MWh	Total Avoided C02 Emission Tons/yr	Total Avoided NOx Emission Tons/yr	Total Avoided SO2 Emission Tons/yr
Lee Nuclear Station	[redacted]						
Summer Nuclear Site							
Vogtle Nuclear Site							
Calvert Cliffs							
South Texas Project							
Comanche Peak							

1.0 Introduction

The U.S. Department of Energy (DOE) has determined that six applications for Federal loan guarantees for nuclear power facilities submitted in response to DOE's June 30, 2008 solicitation issued pursuant to Title XVII of the Energy Policy Act of 2005, 22 U.S.C. 16511-16514 (Title XVII) are in the competitive range for further evaluation.

These proposed nuclear power projects are:

- Lee Nuclear Station (Cherokee County, South Carolina)
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- Calvert Cliffs Unit 3 (Calvert County, Maryland)
- South Texas Project Units 3 and 4 (Matagorda County, Texas)
- Comanche Peak Nuclear Power Plant Units 3 and 4 (Somervell County, Texas)

This Environmental Critique (EC) provides a comparative assessment of the potential environmental impacts associated with these proposals based on an independent review of the representations and data contained within the applications.

DOE's total loan authority for this solicitation is $18.5 billion. DOE does not expect to be able to provide a loan guarantee for all of these proposals, and has initiated a selection process.

DOE has prepared this EC in accordance with its National Environmental Policy Act (NEPA) procedures regarding procurement, financial assistance, and joint ventures (10 CFR § 1021.216g). The purpose of this section of DOE's NEPA regulations is to support the selection process for procurements, awards of financial assistance, and joint ventures by enabling DOE to obtain, evaluate and protect confidential environmental information regarding proposals from applicants and to conduct appropriate selection activities before the NEPA process is complete. The EC represents one aspect of an overall procurement process used to determine which project continues with LGPO due diligence. As such, this EC is a procurement-sensitive document and is subject to all relevant restrictions. An Environmental Synopsis will be made available to the public after the decision making process that does not contain any procurement-sensitive information, per 10 CFR 1021.216(h).

2.0 Purpose of the Loan Guarantee Program

Title XVII authorizes the Secretary of Energy to make loan guarantees for projects that "avoid, reduce or sequester air pollutants or anthropogenic emissions of greenhouse gases; and employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued." A principle goal of Title XVII is to encourage early commercial use in the

United States of new or significantly improved technologies in energy projects that offer the potential to reduce, avoid or sequester air pollutants and/or anthropogenic greenhouse gas emissions. DOE believes that accelerated commercial use of these new and improved technologies would help sustain economic growth, yield environmental benefits and produce a more stable and secure energy supply and economy.

3.0 Assessment Methods

It is critical to note that this Environmental Critique focuses solely on comparing the six proposed nuclear power facilities with each other, as required by DOE's NEPA regulations at 10 CFR § 1021.216(g). The Environmental Critique does not examine other potential sources of electric power, since the DOE loan authority of $ 18.5 billion for the June 30, 2008 solicitation, "Federal Loan Guarantees for Nuclear Power Facilities," is solely for nuclear power facilities, as provided by the Consolidated Appropriation Act, 2008, P.L. No. 110-161.

In developing this EC, DOE independently reviewed and screened Environmental Reports (ERs) submitted to the U.S. Nuclear Regulatory Commission (NRC) by Nuclear Project Company, LLC; Duke Energy Carolinas, LLC; Nuclear Innovative North America, LLC; Calvert Cliffs 3 Nuclear Project, LLC; and South Carolina Gas & Electric.

DOE also independently reviewed the NRC's August 2008 Final EIS for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site, submitted by Georgia Power Company.

The proposed construction and operational activities and their associated areas of potential environmental impacts were screened to determine those impacts that have the potential to be substantive. Potentially substantive impacts from the six proposed projects were then compared, based on information in the ERs. Where the data were not directly comparable, or was not quantitative, DOE developed a qualitative assessment based on best professional judgment

In this review DOE also utilized the NRC's scale[4] of impacts that are presented in NRC EISs. Applicants also use this scale in their ERs.

A brief comparative analysis of greenhouse gas (GHG) and air pollution impacts was also carried out. The methodology used for this study focused on quantifying emissions from

[4] NRC determines the significance of potential environmental impacts based on the Council on Environmental Quality's (CEQ) regulations. There are three significance levels: (1) Small: the environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource; (2) Moderate: the environmental effects are sufficient to noticeably alter but not destabilize important attributes of the resource; and (3) Large: the environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

electric generation units that can be expected to be displaced by the operation of new baseload power from the six nuclear facilities.

4.0 New Reactor Technologies

4.1 Background

A 2008 report by the World Nuclear Association[5] (WNA) identifies three generations of nuclear power reactors. Generation I reactors were developed in the 1950-60s, and outside of the United Kingdom none are still running today. Generation II reactors are typified by reactors currently operating in the U.S. and most in operation elsewhere. Generation III (and 3+) are Advanced Reactors, the first of which are currently in operation in Japan. All of the six nuclear power projects being considered for loan guarantees involve third generation reactors. According to the WNA report, third-generation reactors have:

- a standardized design for each type to expedite licensing, reduce capital cost and reduce construction time,
- a simpler and more rugged design, making them easier to operate and less vulnerable to operational upsets,
- higher availability and longer operating life - typically 60 years,
- reduced possibility of core melt accidents,
- resistance to serious damage that would allow radiological release from an aircraft impact,
- higher burn-up to reduce fuel use and the amount of waste,
- burnable absorbers ("poisons") to extend fuel life.

The greatest difference that distinguishes third-generation from second-generation designs is that many third generation reactors incorporate passive or inherent safety features which require no active controls or operational intervention to avoid accidents in the event of malfunction and may rely on gravity, natural convection or resistance to high temperatures.[6]

4.2 Reactor Technology for Proposed Projects

The six projects being reviewed for loan applications would utilize four different third-generation power reactor designs that are not in commercial use in the United States. These reactor designs are:

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[5] "Advanced Nuclear Power Reactors," World Nuclear Association, December, 2008

[6] Traditional reactor safety systems are 'active' in that they involve electrical or mechanical operation on command. Some engineered systems operate passively, e.g., pressure relief valves. They function without operator control and despite any loss of auxiliary power. Both require parallel redundant systems. Inherent or full passive safety depends only on physical phenomena such as convection, gravity or resistance to high temperatures, not on functioning of engineered components.

- Mitsubishi US Advanced Pressurized Water Reactor (US APWR) – 1 project[7]
- US Evolutionary Power Reactor (US EPR) – 1 project[8]
- Westinghouse Advanced Passive 1000 (AP1000) – 3 projects[9]
- GE[10] Advanced Boiling Water Reactor (ABWR) – 1 project[11]

US-APWR: The Mitsubishi Heavy Industry US-APWR design is an evolutionary 1,700 MWe pressurized water reactor currently being licensed and built in Japan. The design includes high-performance steam generators, a neutron reflector around the core to increase fuel economy, redundant core cooling systems and refueling water storage inside the containment building, and fully digital instrumentation and control systems.

US EPR: The Evolutionary Power Reactor is a 1,600 MWe pressurized water reactor of evolutionary design. Design features include four 100% capacity trains of engineered safety features, a double-walled containment, and a "core catcher" for containment and cooling of core materials for severe accidents resulting in reactor vessel failure. The design does not rely on passive safety features. The EPR plants are currently under construction at the Olkiluoto site in Finland and the Flammanville site in France.

Westinghouse AP1000: The AP1000 is a larger version of the previously approved AP600. This 1,100 MWe advanced pressurized water reactor incorporates passive safety systems and simplified system designs. It is similar to the AP600 design but includes a longer reactor vessel, larger steam generators and a larger pressurizer than the AP600. The passive systems use natural driving forces without active pumps, diesels, and other support systems after actuation. Use of redundant, non-safety-related, active equipment and systems minimizes unnecessary use of safety-related systems

GE ABWR: The U.S. Advanced Boiling Water Reactor uses a single-cycle, forced circulation design with a rated power of 1,300 megawatts electric (MWe). The design incorporates features of the BWR designs in Europe, Japan, and the United States, and uses improved electronics, computer, turbine, and fuel technology. Improvements include the use of internal recirculation pumps, control rod drives that can be controlled by a screw mechanism rather than a step process, microprocessor-based digital control and logic systems, and digital safety systems. The design also includes safety enhancements such as protection against overpressurizing the containment, passive core debris flooding capability, an independent water makeup system, three emergency diesels, and a combustion turbine as an alternate power source.

4.3 Nuclear Regulatory Commission (NRC) Reactor Design Certification

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[7] Comanche Peak Nuclear Power Plant (Somervell County, Texas)
[8] Calvert Cliffs (Calvert County, Maryland)
[9] Lee Nuclear Station (Cherokee County, South Carolina), VC Summer Nuclear Site (Fairfield County, South Carolina), Vogtle Nuclear Site (Burke County, Georgia)
[10] The GE technology has been acquired by Toshiba
[11] South Texas Project (Matagorda County, Texas)

The NRC extensively reviews a proposed reactor design according to a standard design certification process and then, if appropriate, approves the design through public rulemaking. By issuing a design certification, the NRC approves a nuclear power plant design, independent of an application to construct or operate a plant. A design certification is valid for 15 years from the date of issuance but can be renewed for an additional 10 to 15 years.

Design certification is founded on the NRC's review of the application, which addresses the various safety issues associated with the proposed nuclear power plant design independent of a specific site. During this process, the NRC notifies all stakeholders (including the public) as to how and when they may participate in the regulatory process, which may include participating in public meetings and rulemaking activities related to design certifications.

Design certification applicants must provide the technical information necessary to demonstrate compliance with the safety standards set forth in applicable NRC regulations (10 CFR Parts 20, 50, 73, and 100). Applicants must also provide information to close out unresolved and generic safety issues, as well as issues that arose after the Three Mile Island accident. The application must include a detailed analysis of the design's vulnerability to certain accidents or events, as well as inspections, tests, analyses, and acceptance criteria to verify the key design features. The NRC is considering a new rule that would require design certification applicants to assess their plant's level of built-in protection for avoiding or mitigating the effects of a large commercial aircraft impact, reducing the need for human intervention to protect public health and safety.

Two of the four reactor designs for proposed nuclear power loan projects, the GE ABWR and the Westinghouse AP1000, have already been issued NRC design certificates.[12] The NRC expects to issue a Safety Evaluation Report (SER) for the US EPR in June 2011 and for the US APWR in September 2011.

GE Advanced Boiling Water Reactor (ABWR)	Final Design Certification Rule (DCR) May 12, 1997
Westinghouse Advanced Passive (AP) 1000	Final DCR January 27, 2006
US Evolutionary Power Reactor	Final Safety Evaluation Report (SER) scheduled 6/11; no date for DCR
US Advanced Pressurized Water Reactor (US APWR)	Final SER scheduled 9/11; no date for DCR

[12] NRC is currently reviewing a design amendment for the AP1000. Westinghouse submitted an application to amend the AP1000 design in July 2007, in order to: 1) address several "open items" that would otherwise be dealt with in a COL application, 2) voluntarily comply with the intent of the proposed aircraft impact assessment rule, and 3) modify the reactor's pressurizer design. The staff accepted the amendment for review in January 2008 and expects to complete its review in 2009. The rulemaking is tentatively scheduled for completion in 2010.

5.0 Environmental Impacts Associated with All Projects

5.1 Nuclear Waste

Over time uranium fuel loses its efficiency in splitting atoms that produce heat, at which point the uranium becomes high level radioactive waste (spent nuclear fuel). High level waste is hazardous to humans because high radiation levels produce fatal doses during short periods of direct exposure, often even decades after being removed from a reactor. Further, if these contaminants were to get into ground or river water, the potential for large-scale impacts to the food chain and to humans would be great.

NRC has stringent regulations on the design, testing, and handling of spent fuel, such as using boron as a control material in spent fuel containers to prevent criticality. All radiation shielding is verified as sufficiently protective by health physicists and trained engineers.

For each of the six projects analyzed in this report, spent nuclear fuel would be stored in accordance with NRC's regulations and guidelines established to ensure that wastes pose no threat to human health or safety. Since all plants would have to comply with the NRC rule, it is not expected that there would be any large differences between the six facilities in environmental impacts related to waste. Currently most spent fuel is contained in pools at individual reactors, which provide adequate shielding from the radiation for anyone near the pool. Fuel rods are put in arrays 20 feet under water along the bottom of water canals to protect workers. If pool capacity is reached, above-ground dry storage casks made of metal or concrete can be used for both storage and transportation. About 160,000 spent fuel assemblies currently exist throughout the United States, the vast majority in water pools.

5.2 Terrorism

For each of the six projects, strict guidelines regarding terrorism would be followed to ensure that each plant is adequately protected from the threat of attack. Since all plants would have to comply with the NRC regulations, it is not expected that there would be any large differences between the six facilities in environmental impacts related to terrorism. Also, inspections are routinely performed at nuclear plants throughout the country to verify and assess the ability of protective systems and to ensure that defense systems are strong enough as not to pose a threat to public health or safety. It should be noted that nuclear plants are not significant risks of air attacks because they are made of strong steel and concrete materials, and are generally very small targets. Additionally, through a collaboration of the military and the Department of Homeland Security, critical infrastructure is identified and protected in the case of a potential attack.

Nuclear plants are heavily guarded with well-trained and armed personnel as well as layered physical security measures such as access controls, water barriers, intrusion detection and strategically placed guard towers. Together these security measures make

up the Design Basis Threat (DBT), which is developed from real world intelligence information and is confidential and highly protected to avoid the information being obtained by adversaries. The threats examined by NRC include physical, cyber, and biochemical terrorism, coordinated attacks from a team of insiders, potential suicide attacks, water and air-based threats, use of large-scale explosives, attacks from experts of nuclear technology, and the threat posed by long-lived fires.

5.3 Nuclear Safety

Design certification applicants must provide the technical information necessary to demonstrate compliance with the safety standards set forth in applicable NRC regulations (10 CFR Parts 20, 50, 73, and 100). Applicants must also provide information to close out unresolved and generic safety issues, as well as issues that arose after the Three Mile Island accident. The application must include a detailed analysis of the design's vulnerability to certain accidents or events, as well as inspections, tests, analyses, and acceptance criteria to verify the key design features. The NRC is considering a new rule that would require design certification applicants to assess their plant's level of built-in protection for avoiding or mitigating the effects of a large commercial aircraft impact, reducing the need for human intervention to protect public health and safety.

A nuclear power plant is equipped with four major types of safety systems to prevent accidents and reduce their effects if one should occur:

1. A system to quickly shut down a reactor and stop the fission chain reaction. Each reactor has a shutdown system in place, whereby the plant operator inserts control rods into the reactor core triggering an immediate shutdown of all fission reactions, protecting the plant from any unusual conditions or potential threats.
2. Numerous systems to control reactor pressure and to continue cooling the reactor fuel -- that is, to carry away the heat that continues to be generated even after the reactor is shut down. These systems are called Emergency Core Cooling Systems (ECCS).
3. Electrical, control, and instrument systems for safety systems and for monitoring reactor conditions.
4. System of barriers to contain radioactivity if it should escape from the reactor fuel in an accident.

Nuclear plants have three main ways of controlling radioactivity: sealed fuel rods, the reactor vessel and related components, and the reactor containment. Even if a serious accident damaged the fuel rods, and damage to the cooling system breached the reactor vessel, the reactor containment itself is designed to contain any release of radioactive material that might otherwise be released to the atmosphere. NRC requires that all containment be tested to establish that it is safe from potential leakage. Even in the extremely unlikely cases of complete loss of cooling ability, the majority of radioactive material release would be contained. As mentioned earlier, all six facilities will employ Generation 3 reactors with substantially improved safety features.

Workers at nuclear power plants are exposed to minimal amounts of radiation, and NRC ensures their safety with strict regulation on the amount of exposure any worker can be subject to in a calendar year. No worker can be exposed to more than 5 rems per year, and residents receive less than 1% of their annual radiation exposure from the plant.[13] The average nuclear power plant worker is exposed to approximately one-fifth of the amount of cosmic radiation received by airline pilots and cabin crews regularly flying from New York to Tokyo.

5.4 Earthquake Safety

NRC requires all nuclear power plant applications to include safety structures that assure protection against the effects of earthquakes in maintaining their core functions. Licensees must include in their applications the most severe natural phenomena historically reported for the site and surrounding area, effects of the combination of accident conditions with the effects of natural phenomena, and the role of the safety functions provided. All new power plants must use a probabilistic, performance-based approach to assess the safety against seismic threats.

NRC regularly reviews new data and materials on earthquake source and ground motion models and now requires this information be included in any early-site permits provided by applicants. New analyses suggest increased risk in the central and eastern United States. Review of United States Geologic Survey (USGS) hazard estimates confirmed that slightly higher risks exist in these areas than previously thought. NRC is currently in the process of assessing available earthquake data and models to determine whether any existing plants are vulnerable. All of the nuclear power plants discussed in this critique will be subject to new, more vigorous earthquake safety analysis as a result of NRC's heightened attention to the issue.[14]

[13] Exposure to radiation is called a "dose" and is expressed in the measures rem and millirem. A rem measures the effect of radiation on the human body. It takes into account both the amount of radiation deposited in body tissues and the type of radiation. A millirem (mrem) is a thousandth of a rem. The average person receives about 20 millirems from a chest X-ray.
<http://www.nei.org/keyissues/safetyandsecurity/factsheets/safetystudiespublicworkers/>

[14] Seismic Issues for Existing Nuclear Power Plants
<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/fs-seismic-issues.pdf>

6.0 Comparative Greenhouse Gas (GHG) Avoidance

A brief comparative analysis of GHG and air pollution impacts was carried out by the Resource Systems Group, Inc. (RSG) under contract with DOE.[15]

The methodology used for this study focused on quantification of the emissions from generation units that can be expected to be displaced by the operation of new nuclear units generating baseload power. The generation displaced is from variably dispatched fossil fueled units.

All six proposed plants are expected to avoid CO2 and air pollution emissions that would occur if fossil sources were used for baseload electricity generation instead of nuclear (see figure below). As the table shows, there are two different ways of looking at CO2, NOx, and SO2 reduction at each plant: (1) the avoided emission *rate,* i.e., pounds of emissions avoided per megawatt hour; and (2) the *total tons of emissions avoided per year.* The relative ranking of the six plants may vary depending on which measure is used.

The results for avoided emission *rates* vary primarily with the regional mix of marginal units in each of the three NERC regions, i.e., the proportion of power which would come from coal and gas. While all six projects would displace a mix of coal and gas fired generation, the greater use of coal in the [redacted] results in a higher avoided emissions rate for CO2, SO2 and NOx for [redacted] which all have the same rate, are next, and the lowest rates are for [redacted]

On the other hand, the results for the *total tons* of emissions avoided not only reflects the displacement of coal and natural gas in each NERC, but is also influenced by the relative size of the plants. Using this measure, [redacted] which had the lowest CO2 avoided *rate*, had the largest total CO2 avoidance. [redacted] were next, providing nearly identical total CO2 avoidance amounts. [redacted] had a total CO2 avoidance volume somewhat greater than [redacted] which had the lowest total annual CO2 emissions avoided despite having the highest avoidance rate.

The ranking of the six projects for total tons of SO2 avoided is the same as the ranking for the avoided emission rate, despite the relatively smaller size of the [redacted] plant. The ranking for total tons of NOx avoided differs somewhat from the avoided emissions rate, with [redacted] in the lead, followed closely by [redacted] last. It should be noted that projections of both

[15] Colin High and Kenneth Kaliski, "An Evaluation of the Grid Connected Avoided Emissions from the Operation of Proposed Nuclear Power Plant Projects Applying for Loan Guarantees from the US Department of Energy, April 2, 2009." The approach used in this analysis is generally consistent with "Guidelines for Quantifying GHG Reductions from Grid-Connected Electricity Projects" developed by the World Resources Institute. The methodology used is based on the same analytical model used by RSG for the DOE Office of Energy Efficiency and Renewable Energy. EPA's database of hourly data on CO2 emissions from Continuous Emission Monitors.

[redacted]

the avoided emissions rate and total tons of avoided NOx and SO_2 are more variable than those for CO_2, due to variability in the controls on NOx and SO_2. The projections are likely to change over time as NOx and SO2 controls become more stringent in all regions.

Plant Name	Annual Generation MWh	Avoided C02 Emission Rate lb/MWh	Avoided NOx Emission Rate lb/MWh	Avoided SOx Emission Rate lb/MWh	Total Avoided C02 Emission Tons/yr	Total Avoided NOx Emission Tons/yr	Total Avoided SO2 Emission Tons/yr
Lee Nuclear Station							
Summer Nuclear Site							
Vogtle Nuclear Site							
Calvert Cliffs							
South Texas Project							
Comanche Peak							

7.0 Project Site-Specific Impacts

This section briefly describes the site-specific environmental impacts for each proposed project. All impact intensity ratings of small, moderate, and large are adopted from the NRC scale (see pg. 2).

7.1 Calvert Cliffs 3

Calvert Cliffs 3 is an Evolutionary Power Reactor (EPR) slated for Unistar's Calvert Cliffs 2,070 acre site near Lusby, Maryland in Calvert County, on the west bank of Chesapeake Bay, approximately halfway between the mouth of the bay and its headwaters at the Susquehanna River. The net electrical output of the plant would be approximately 1,600 MW in the PJM (Pennsylvania, New Jersey, and Maryland) market with an expected completion date of 2016.

After evaluating the ER, the LGPO has determined that the following environmental effects related to construction and operation of the Calvert Cliffs Nuclear Power Plant (CCNPP) are unlikely to have greater than a small impact, either because there is no or a minimal impact or adequate mitigation is incorporated into the proposal:

- Water quality - any potential construction impacts to aquatic resources would be mitigated by best management practices. No sensitive species are known to exist in the area and construction and operation are expected to have a small impact on the aquatic ecology of the Chesapeake Bay.
- Water use - withdrawals would come primarily from the Chesapeake Bay with consumptive rates of approximately 820 million gallons per month, with use varying by temperature and humidity. Impacts to water resources are also expected to be small, with similar withdrawals to those of the existing reactors.
- Air quality - strict permitting requirements for plant emissions are required for a non-attainment zone; therefore, impacts to air quality are expected to be small.
- Historic Resources - in view of the fact that new reactors will be built on and in existing reactor sites, there would be no potential impact to historic resources.

The impacts discussed below were identified as having a greater than small or small to moderate impact in the ER:

- Land Use

Construction is expected to result in the loss of 14.3 acres of wetlands and wetlands buffers. Accordingly, the ER rated the impact as "moderate" because of mitigation measures expected to be implemented in cooperation with the Army Corps of Engineers (ACOE) during the Clean Waster Act Section 404 Permit process. 147 acres of land currently zoned as farm or forest will be permanently disturbed of the 281 acres committed to the CCNPP project. 163 acres of mixed deciduous forest would be permanently lost as a result of the project.

- Transportation

A traffic study performed for the proposed CCNPP indicates that peak construction traffic will top 1,450 vehicles per hour with heavy vehicle shipments and construction trips expected to account for the majority. A peak construction force of 3,950 workers is expected to cause the greatest congestion during morning and evening commutes. Impacts are expected to be temporary and likely to end after construction of the plant, when impacts to transportation are expected to be small for plant operation. With a construction traffic management plan and coordination with local planning authorities for upgrading of roads, as well as encouraging carpooling and use of public transportation, the impacts to transportation of construction are expected to be small to moderate.

- Terrestrial ecosystems

The CCNPP site is largely forested amongst large tracts of other forested areas that form one contiguous region of undeveloped forest lands. The Wildlife Habitat Council has registered the CCNPP site as a valuable corporate wildlife habitat[17], with two federally listed threatened species toward the base of the site: the puritan tiger beetle and the beach tiger beetle. Additionally the federally listed threatened bald eagle has nests on the plant site. Construction impacts to terrestrial resources are expected to be moderate because habitats will be encroached on, however impacts during operation itself are expected to be small.

7.2 Comanche Peak 3 and 4

Comanche Peak 3 and 4 Advanced Pressurized Power Reactor (APWR) would be sited at the Comanche Peak Site near Glen Rose in Summerville County, Texas, a 7950-acre site located in rural portions of Hood and Somervell counties of north central Texas. The output of the plant is expected to be about 3,400 MW for the two reactors.

After evaluating the ER, the LGPO determined that the following impacts related to construction and operation of the Comanche Peak Nuclear Power Plant (CPNPP) (with the exception of new transmission lines) are unlikely to have a greater than small impact, either because there is no or a minimal impact or adequate mitigation is incorporated into the proposal.:

- Land use - the CPNPP will disturb about 4,500 acres of the 7,950 acre plant site; however, impacts are expected to be small with little potential for erosion. Mitigation measures would result in only 659 acres being converted on a permanent basis with the vast majority being returned to its original state.

[17] The Wildlife Habitat Council's *Corporate Wildlife Habitat Certification/International Accreditation Program* recognizes commendable wildlife habitat management and environmental education programs at individual sites. WHC certification adds value to programs by providing third-party credibility and an objective evaluation of projects. <http://www.wildlifehc.org/registry_certifiedsites/index.cfm>

- Water use - the majority of the water used would be taken from Lake Granbury with a negligible impact on water availability downstream or in the vicinity of the plant. Cooling water would be recirculated.
- Air quality - the plant would be subject to strict permitting requirements for emissions because it would be located in a non-attainment zone; therefore, impacts to air quality are expected to be small. Small area quality impacts are anticipated from discharge of atmospheric vapor plume and through minor emissions from generators or auxiliary boilers.
- Aquatic ecosystems - construction activities near Lake Granbury, including the crossing of transmission lines over Lake Granbury, might cause a small impact to individual organisms and local aquatic habitat. No permits are necessary as engineering protective measures will be used around the site.
- Water Quality - construction activities will result in a small impact with respect to erosion, sediment discharge, and stormwater runoff into the local reservoir.
- Historic Resources - the site presents a small potential to disturb cultural, historic or archaeological resources, however mitigation measures will be implemented.

The impacts discussed below were identified as having a greater than small or small to moderate impact in the ER or still need additional information to reach a conclusion:

- Socioeconomic impacts

The project would result in short-term and long-term changes to population, the character of the community, and the socioeconomic makeup. Indirect and secondary growth in the region is expected with small to moderate impacts on community services, which could be mitigated through incremental tax revenues. Noise and traffic congestion may also present small to moderate impacts, most of this will be mitigated by commuting assistance and other measures.

- Transmission Lines

Two new transmission lines will be required, one 345-kV and one 138-kV, requiring new transmission corridors and additional lines. Overall, four circuits connecting switching stations will be necessary including (a) new 45-mile circuit through a new right of way (ROW), the routing of which will be determined in a transmission study; (b) a 22.4 mile circuit utilizing a vacant circuit position; (c) 17-mile circuit within a new ROW to be determined by a study; and (d) 41.6 mile circuit utilizing a vacant circuit position.

7.3 South Texas Project (STP) 3 and 4

STP 3 and 4 Advanced Boiling Water Reactors (ABWR) would be built on the 12,220 acre STP site approximately 12 miles south-southwest of the city limits of Bay City, Texas, and 10 miles north of Matagorda Bay, along the west bank of the Colorado River. The plant footprint for STP 3 & 4 is approximately 2000 feet northwest of existing STP 1 & 2 and is generally the area that had been designated for two additional units when the

facility was first planned. The two reactors will generate 2,700 MW with an expected completion date of 2016 for the first reactor and 2017 for the second.

After evaluating the ER, the LGPO has determined that the following impacts related to construction and operation of the STP 3 and 4 are unlikely to have a greater than small impact, either because there is no or a minimal impact or adequate mitigation is incorporated into the proposal:.

- Land use - land use impacts for the South Texas Plant Nuclear Operating Company (STPNOC) are expected to be small, with 90 acres dedicated to the plant.
- Historic Properties - no impact from plant operation is expected to historic properties since no additional transmission corridors are required for STP 3 & 4. STPNOC concludes that construction impacts to historical or cultural resources would be small and not warrant mitigation.
- Biological Resources- small, temporary impacts to wildlife are expected during the construction phase.
- Transmission lines- two 345kV power lines would be upgraded on the STP site to their connection at the Hillje substation 20 miles northwest of the STP site; however, no new rights of way will be required outside the STP site.

The impacts discussed below were identified as having a greater than small or small to moderate impact in the ER or still need additional information to reach a conclusion:

- Water Use

Small to moderate impacts to groundwater availability are anticipated during the life of the plant. STPNOC is currently evaluating the possibility of permitting and installing additional groundwater wells because the plant's use requirements may exceed withdrawal rates allowed by the Coastal Bend Groundwater Conservation District (CPGCD). On average 1,242 gallons per month of groundwater usage are anticipated with total peak consumption of approximately 4,108 gallons per month. Small to moderate unavoidable impacts to surface water availability from the Colorado River are expected during the life of the plant.

- Socioeconomics

Workforce population growth is expected to increase development for commercial and residential purposes, resulting in a small to moderate beneficial impact. Increases in rental rates and housing prices are expected to have a potential adverse effect. Increased student populations and traffic volume are also expected.

- Wastewater

Increased wastewater volumes are expected as a result of the in migration of workers. Contact with local governments units will be maintained so that effective community planning can take place in addressing each of these issues.

- Coastal Zone and Wetlands

The STPNOC project is located almost entirely within a coastal zone as defined by the Texas Coastal Management Program (CMP). Small to moderate construction impacts are expected to take place within the coastal zone. Mitigation would include maintaining consistent contact with local and regional governmental and nongovernmental organizations to ensure that all activities are compliant with CMP laws and regulations. 12 small non-jurisdictional wetlands would be impacted by construction and operation; however, impacts to wetlands or surface water drainage in the vicinity of the proposed excavation would be small and not warrant additional mitigation.

7.4 Virgil C. Summer Nuclear Site (VCSNS)

SCE&G proposes to build and operate two new Westinghouse AP1000 light water reactors at a site approximately 15 miles west of Winnsboro, S.C. and 26 miles northwest of Columbia, S.C. The new plant would be south of the existing VCSNS Unit 1 and is generally in the area that was used for laydown of construction materials and the source of borrow material during the construction of Unit 1. The site is in a sparsely populated, largely rural area, with forests and small farms comprising the dominant land use. The Broad River flows in a northwest-to-southwest direction 1 mile to the west of the site. Three additional transmission lines would be required for each new reactor, for a total of six lines. Specific routing of the new transmission lines is not known at this time. The ER identifies potential impacts to land uses and protected species in the 10 South Carolina counties that the lines could cross.

After evaluating the ER, the LGPO has determined that the following impacts related to construction and operation of the VCSNS (with the exception of new transmission lines) are unlikely to have a greater than small impact, either because there is no or a minimal impact or adequate mitigation is incorporated into the proposal.:

- Land use – approximately 240 of the 500 acres disturbed during site preparation and construction would be dedicated permanently to the new units and their supporting facilities. Temporary facilities and spoils storage would affect an additional 180 acres. Adverse impacts are not expected for endangered species, cultural resources, wetlands, storm water runoff, floodplains, farmland, local zoning requirements, coastal zone, and wild and scenic rivers

- Water quality – solids and organic compounds from cooling tower blowdown would be discharged in compliance with NPDES permits to the Broad River and the Parr Reservoir.

- Water use – The new facility would use approximately 1% of the Broad River average annual flow and 2.9% - 3.25 % of the lowest annual mean flow at Alston, S.C., mainly due to evaporation from the new units' cooling towers. Consumptive losses of this magnitude would be barely discernible on the flow of the Broad River. At low-flow periods, impacts could be mitigated by using reservoirs as a water source for the plant.

- Air quality - discharges of atmospheric vapor plumes may produce ground level fogging infrequently. Given the remote location of the facility, any impact from this is expected to be small. Salt drift from the cooling towers is expected to have no more than a slight impact. There would be minor emissions from generators or auxiliary boilers.

- Terrestrial ecosystems – only minor effects are anticipated, given the limited impacts on land and water use and the absence of major air emissions.

- Aquatic ecosystems - only minor effects are anticipated, given the limited impact on land and water use and the composition and volume of water discharges.

- Aesthetics and recreation - only minor effects from construction of water intake and discharge structures and construction of a crane tower are anticipated on the Monticello and Parr Reservoirs. No impact is expected on the Parr Hydroelectric Project Wildlife Management Area.

- Public and social services – water supply and treatment facilities, public safety and educational resources, and social services in the surrounding area are expected to be adequate to accommodate the temporary increase in population due to an in-migration of construction workers.

The impacts discussed below were identified as having a greater than small or small to moderate impact in the ER:

- Transportation

  Roads within the vicinity of the project will experience an increase in traffic due to the estimated 800 new workers at the facility for plant operations; however, the current road network has sufficient capacity to accommodate the increase.

- Economic Impact and Taxes

  The ER identified potentially small to moderate beneficial economic impacts and small to large impacts on taxes. Two counties, Fairfield and Newberry, are expected to have an increase in business activities as a result of the operations workforce that is expected to settle in these counties. The impact is beneficial and no mitigation is required. Fairfield County is expected to have a moderate to large increase in property tax collections as a result of the project. It is not

expected that the increase in property tax collections would have a major change on land-use in this county.

- Environmental Justice

  234 of the 803 census blocks within a 50 mile radius of the proposed project were found to have significant aggregate minority population percentages (either greater than 50% minority or a minority population more than 20 percentage points greater than the minority population in the geographic area) and 45 were found to have a significant percentage of low-income households (greater than 50% or more than 20 percentage points greater than the low-income population in the geographic area). No adverse environmental or health impacts are expected. A moderate beneficial economic impact may occur.

- New Transmission Lines

  Since the corridor or corridors for six new 230 kV transmission lines through 10 South Carolina counties has not been identified, it is not possible to definitively characterize the impacts. The total miles of new transmission line is approximately 177 miles; these could be routed in existing corridors to the extent practicable. Specific routes would be determined after the decision is made to construct the new units, using siting procedures that address land use, environmental impacts, and cultural resource impacts. In general, it is anticipated that the three new lines for Unit 2 could follow portions of existing corridors. This could require constructing new structures, moving existing ones, or widening existing rights-of-way and/or new corridors. The three new lines for Unit 3 would generally require new corridors. The ER acknowledges that until the new corridors are sited, the specific environmental impacts can not be quantified. The ER references the discussion of transmission impacts in NRC's 1996 Generic Environmental Impact Statement for License Renewal of Nuclear Plants and, based on that information, asserts that any impacts associated with the new VCSNS transmission lines would be small.

7.5 Lee Nuclear Station (Cherokee County, South Carolina)

The Lee Nuclear Station will be constructed by Duke Power on the site of the former Duke Power Cherokee Nuclear Station located in the eastern portion of Cherokee County in north-central South Carolina, 40.1 miles southwest of Charlotte, N.C. The Lee site encompasses approximately 1900 acres and was evaluated in the early 1970s for construction of three nuclear units. 750 acres of ground were subsequently disturbed when construction began in 1977. Construction was halted in 1982. The proposed plant would be constructed within the large, open, contiguous area of land that was cleared for previous construction activities. Additional on-site areas are expected to be cleared for the cooling water intake structure, the cooling water discharge structure, a new meteorological tower, and the rerouting of the overlook road. A total of 270 acres will be

cleared during construction of the proposed project, of which 141 acres will be occupied by permanent facilities.

After evaluating the ER, the LGPO determined that the following impacts related to construction and operation of the Lee Nuclear Station (with the exception of new transmission lines) are unlikely to have a greater than small impact, either because there is no or a minimal impact or adequate mitigation is incorporated into the proposal:

- Land-use effects - most of the construction for the station will occur on 750 acres of land that has been disturbed by previous construction and site preparation. Most of the construction does not disturb any previously undisturbed land. 2 acres of farmland of statewide importance on the site are away from areas that will be heavily disturbed.

- Water quality - much of the potential water-related modifications of this site were made during the original construction of the Cherokee plant. The impact on the Broad River of thermal discharges and cooling tower blowdown are expected to be small. Similarly, there will be some increased discharge of water treatment chemicals from tower blowdown and from waste treatment systems, but little adverse impact is anticipated.

- Air Quality – temporary and minor impacts to local ambient air quality could occur as a result of normal construction activities. Impacts on air quality could be minimized by compliance with all federal, state and local regulations that govern construction activities and emissions from construction vehicles.

- Aquatic ecosystems – potential impacts from construction-related runoff will be controlled by NPDES limitations for storm water discharge. Thermal impacts from operation will be minimized by cooling towers and a closed-loop cooling system, although there may be small impacts (an increase of no more than 1.7 degrees F) from tower blowdown.

- Terrestrial ecosystems – potential impacts from construction-related runoff will be controlled by NPDES limitations for storm water discharge. Salt deposition rates from cooling tower vapor are not expected to be at levels that will have more than a small impact on vegetation.

The impacts discussed below were identified as having a greater than small or small to moderate impact in the ER or, in the case of water use, may have an impact on operations or are of concern to the public.

- Traffic

  There may be small to moderate impacts on traffic on smaller two-lane state and county highways and local roads from increased traffic from construction workers and deliveries to the site. Potential mitigation measures being considered include

widening one local road, installing traffic-control lighting and directional signage, creating an additional entrance to the site to alleviate traffic at the primary plant entrance, establishing a centralized parking area away from the site and operating shuttles to and from the site, encouraging carpooling, and staggering shifts.

- Noise

  Traffic from workers and deliveries during the construction period could potentially have a moderate to large impact on residences, churches and businesses along local feeder roads. Some of the traffic mitigation measures discussed above should also alleviate some of the noise impact. Other noise mitigation measures being considered include creating an additional entrance for heavy truck deliveries to the site to alleviate traffic at the primary plant entrance, utilizing a rail spur for larger deliveries, and limiting speed on the main local road that would be impacted.

- Social and Economic Impacts

  The project is expected to have a moderate to large beneficial impact on the local economy and tax collections in Cherokee County. The influx of workers required for construction will increase housing demand and the use of recreational vehicle parks for worker housing, which could impact recreational users. Temporary housing needs are also likely to impact local hotels and motels. The in-migration of workers may increase the public school population in Cherokee County by 3.8% and York County by 1%. Possible mitigation measures for the impact in Cherokee County could include hiring additional teachers and purchasing modular classrooms. It is expected that increased costs for these measures will be offset by increased tax collections related to the plant.

- Environmental Justice

  Competition for rental and temporary housing and market-driven rate increases are anticipated to impact low-income populations.

- New Transmission Lines

  Duke Energy's electrical system planners are conducting a comprehensive siting study to determine the routes for new electrical transmission lines to connect the Lee Nuclear Station to the existing electric transmission grid. Duke Energy has determined that two existing lines could be modified ("folded in") to run to the station's proposed switchyard. A fold-in configuration requires that each of the existing lines be diverted from its current route at two points to enter and depart from the switchyard. The lines to be folded in currently run east to west about 16 miles and 8 miles south of the station. One eight-mile 325 foot corridor will be required to bring the more distant line to the nearer one and then two 325 foot eight-mile corridors will be required to link to the station.

- Water Use

  The Lee plant will take water from the Broad River subject to permit conditions set by the Federal Energy Regulatory Commission and the South Carolina Department of Health and Environmental Control. Under normal river conditions, approximately 2% of the mean annual flow of the monthly average river flow is expected to be lost to water withdrawal and evaporation. This volume could adversely affect the hydrologic conditions of the Broad River under low-flow conditions. Water will be pumped from the river to Make-up Pond A. During periods of low flow, water may also be taken from another pond, Make-up Pond B. Because there are limits on the amount of water that can be withdrawn from the river to the plant, it is not anticipated that there will greater than small environmental effects on the river. However, water availability is likely to affect plant operation. The capacity of the Broad River and Make-up Pond B might be exceeded once every 12.2 years, and station operations would potentially have to be curtailed during this condition. An evaluation in the EIS indicated that for hypothetical operation over an 81 year period of record, operations would have been curtailed once during the 1998-2002 drought, when operations would have been curtailed for 42 days during June-September 2002. Part of this outage would have coincided with the summer peak power demand.

7.5 Vogtle Nuclear Site Units 3 and 4

The Southern Nuclear Operating Company (Southern) proposes to build and operate two additional Westinghouse AP-1000 reactors (Units 3 and 4) within the 3169 acre Vogtle Electric Generating Power (VEGP) site in Burke County Georgia, Georgia. The total combined thermal power rating of the new units would be 2200 MW. The site is located on the shores of the Savannah River approximately 15 miles east-northeast of Waynesboro, Georgia and 26 miles southeast of Augusta and is across the river from DOE's Savannah River Site. Most of the water demands associated with the operation of the proposed new reactors would come from the Savannah River; groundwater use would total about 9 percent of the project's water demand and would primarily be used to meet operational water demands associated with systems requiring relatively pure water, such as demineralized and potable water systems. One new 60-mile 500-kV transmission line from the VEGP site to Augusta would be constructed to handle the power generated by the proposed units. Although the precise route of the new transmission line has not yet been determined, a routing study of the planned route has been prepared.

In August 2008 NRC issued its Final EIS for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site. After evaluating this EIS the LGPO has determined that the following impacts related to construction and operation of the Vogtle Nuclear Site Units 3 and 4 (with the exception of a new transmission line) are unlikely to have any major adverse impact, and they are not analyzed further in this Environmental Critique:

- Land use effects

- Air quality impacts
- Water use
- Water quality
- Terrestrial ecosystems
- Aquatic ecosystems
- Environmental Justice
- Transportation
- Noise

The impacts discussed below were identified by NRC in the EIS as having a greater than small or small to moderate impact:

- Socioeconomic Impacts

  The ESP FEIS estimated a worse-case scenario of 2500 workers in-migrating to the region (2000 of them for more than 2 years) for construction of the facility. In one county (Burke County, Ga.) there could be a moderate temporary impact from this influx. The other counties in the region would only have a small impact from population growth related to the plant. Similarly, Burke County is forecast to have a moderate and beneficial economic impact, including increased tax collections, from the project. Other counties in the region will experience small economic impacts.

- Transportation

  Burke County could experience a small to moderate increase in traffic on two-lane highways from workers and deliveries going to and from the site. This may require developing a traffic management plan prior to construction. The plan might include measures such as installing turn lanes at the construction site, establishing a centralized parking area away from the site, and shuttling construction workers to the site in buses or vans, using incentive programs to encourage car-pooling, and staggering construction and operations shifts.

- Historic and Cultural Resources

  Surveys and tests in 2006 found two archaeological sites in the area to be impacted by the new units to be eligible for listing in the National Register. The Georgia Office of Historic Preservation concurred in this finding. Southern determined that it would not be possible to avoid one site and carried out additional field investigations in 2008. Results of the investigations were minimal, suggesting that the area to be impacted does not contain significant archaeological deposits.

- Transmission Line

One new 500-kV transmission line would be constructed to handle the power generated by the proposed VEGP Units 3 and 4. The new line would be routed from the plant site to the Thomson-Vogtle substation west of Augusta, Georgia. The line would be 60 miles along, with a 150 foot wide right-of-way and would require approximately 390 towers. Currently, Southern is evaluating right-of-way alternatives for the transmission line corridor within a Representative Delineated Corridor (RDC). It is anticipated that the transmission line corridor would cross four Georgia counties. There are no U.S. Forest Service Wilderness Areas, Wild/Scenic Rivers or Wildlife Refuges, or State or National Parks within the RDC. The ER indicates that there may be small to moderate land-use, ecological, and aesthetic impacts from the transmission line.

8.0 Summary of Differences in Potential Environmental Impacts Among the Proposals

8.1 Transmission Line Corridors

The greatest difference in the site-specific impacts of proposed projects is the extent of new transmission lines that will be required. As the table below shows, new transmission line corridor requirements range from more than 300 miles to none.

PLANT	MILES OF NEW TRANSMISSION CORRIDOR[18]
VCSNS	177
Vogtle	60
Comanche Peak	62
Lee	24
South Texas Plant	None[19]
Calvert Cliffs	None

The ERs for Comanche, VCSNS, and Lee all indicate that the specific corridor or corridors for the new lines have not yet been delineated. Vogtle has developed a Representative Delineated Corridor, which does not precisely identify the transmission route but does narrow the range. All ERs indicate that any environmental impacts would be mitigated as a result of consultation with resource agencies (for example, the U.S. Fish and Wildlife Service) and regulatory agencies (such as the Army Corps of Engineers) once a detailed route is developed. Nevertheless, having extensive new transmission line requirements adds some uncertainty to a current assessment of environmental impacts and potential regulatory requirements and could potentially create delays in these projects.

8.2 Water Availability

[18] New line required outside plant site boundary; some have two or more lines in the same corridor.
[19] Two existing transmission lines will be upgraded over an existing 20 mile right of way

Water availability has been raised as an issue for three of the projects. Most affected is the Lee plant in S.C., where the ER indicates that water availability from the Broad River might be exceeded during drought conditions once every 12.1 years and that station operations would potentially have to be curtailed.

The South Texas Plant ER indicates that STPNOC is considering installing additional groundwater wells because the plant's use requirements may exceed the withdrawal rates allowed by the Coastal Bend Groundwater Conservation District (CBGCD). The ER projects a small to moderate environmental impact related to increased groundwater withdrawal but does not provide details in the ER.

The proposed VCSNS in S.C. is also on the Broad River downstream from the proposed Lee Plant. Water availability has been raised as an issue; however, the ER does not project any impact on operations, since it will be possible to withdraw water from nearby reservoirs if Broad River levels are low. Planned water withdrawals from the river are not expected to result in more than a small impact.

8.3 NRC Permitting

No environmental impacts were identified related to reactor design; however, the fact that the AP1000[20] and the GE (Toshiba) ABWR[21] have received NRC design certification means that at this time there is less uncertainty regarding potential environmental impact (and therefore less risk of delay) related to reactor design for projects using these technologies.

The Vogtle project has already received an Early Site Permit (ESP) from the NRC and a Final EIS has been completed for this site, which eliminates the need to consider alternative sites in the EIS conducted for the license application. Furthermore, since the EIS has been reviewed by the public and state and federal resource agencies, the assessment of environmental impacts at the site is more certain than for projects just starting the process. Similarly, uncertainty about the timing of the NEPA process is also reduced by having the ESP NEPA review completed.

8.4 Wetlands

The Calvert Cliffs 3 ER indicates that 14.3 acres of wetlands will be filled and that a permit from the Army Corps of Engineers will be required.

8.5 Safety, Terrorism, and Waste

The EC did not find any significant differences in environmental impact related to safety, waste, and terrorism, since all plants are closely regulated in these areas by the NRC and therefore subject to the same control measures.

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[20] Lee, VCSNS, and Vogtle
[21] South Texas Plant

Calvert Cliffs	Commanche Peak	Lee Nuclear	Vogtle	STP	VCSNS
Moderate impacts from construction due to loss of 14.3 acres of wetlands, a 404 Permit will be required from ACOE	Small	Small	Small	Small	Small
Small	Small	Small	Small	Increased wastewater volumes are expected as a result of the in migration of workers.	Small
Small	Small	Potential impact on operations and reliability	Small	Small to moderate – impacts to groundwater availability are anticipated during the life of the plant; unavoidable impacts to surface water availability during the life of the plant are expected	Small
Small	Small	Small	Small	Small	Small
Small to moderate due to two federally listed threatened species toward the base of the site, federally listed threatened bald eagle has nests on the plant site	Small	Small	Small	Small	Small
Moderate due to loss of wetlands and wetland buffers and would require mitigation	Small	Small	Small to moderate due to transmission line installation	Small to moderate due to site located almost entirely within coastal zone	Small
Small to moderate due to peak construction traffic that would top 1,450 vehicles per hour; peak construction force of 3,950 workers is anticipated	Small	There may be small to moderate impacts on traffic on smaller two-lane state and county highways and local roads from increased traffic from construction workers/deliveries to site.	Small to moderate increase in traffic on two-lane highways from workers and deliveries going to and from the site	Small traffic congestion impacts are anticipated	Small to moderate due to increased traffic from 800 new workers.
Small	Small to moderate due to short-term and long-term changes to population, the character of the community, and the socioeconomic makeup; indirect growth is expected.	Competition for rental and temporary housing and market-driven rate increases are anticipated to impact low-income populations	Small to moderate from in-migration of workers	Moderate to large positive socioeconomic impacts. Small to moderate workforce population growth, increasing development for commercial/residential, and increased student populations	Small to moderate beneficial economic; small to large beneficial impact on property tax collection.
Small	Small to moderate (Construc)	Small	Small	Small	Small
Small	Two new transmission lines will be required, one 345-kV (45 mi. in new ROW) and one 138-kV (22.4 mi), requiring new transmission corridors and additional lines	Total of 24 new lines required, one eight-mile 325 foot corridor required to bring the more distant line to the nearer one and then two 325 foot eight-mile corridors will be required to link to station	One line would be required: 60 miles long, with a 150' wide right-of-way and would require approximately 390 towers with small to moderate land-use, ecological, and aesthetic impacts	Small	3 new lines anticipated through 10 South Carolina counties, could require new structures, moving existing ones, widening right-of-ways, and new corridors.

[redacted]	Small	Small	Small to moderate due to ground disturbing activities	Small to moderate due to two archaeological sites in the area to be impacted by the new units	Small	Small