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

NUREG-1437
Supplement 33

Generic Environmental Impact Statement for License Renewal of Nuclear Plants

Supplement 33

Regarding Shearon Harris Nuclear Power Plant, Unit 1

Draft Report for Comment

Office of Nuclear Reactor Regulation

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Any interested party may submit comments on this report for consideration by the NRC staff. Comments may be accompanied by additional relevant information or supporting data. Please specify the report number NUREG-1437, Supplement 33, draft, in your comments, and send them by March 05, 2008 to the following address:

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ABSTRACT

The U.S. Nuclear Regulatory Commission (NRC) considered the environmental impacts of renewing nuclear power plant operating licenses (OLs) for a 20-year period in its *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2, and codified the results in Part 51 of Title 10 of the *Code of Federal Regulations* (10 CFR Part 51). In the GEIS (and its Addendum 1), the NRC staff identifies 92 environmental issues and reaches generic conclusions related to environmental impacts for 69 of these issues that apply to all plants or to plants with specific design or site characteristics. Additional plant-specific review is required for the remaining 23 issues. These plant-specific reviews are to be included in a supplement to the GEIS.

This draft supplemental environmental impact statement (draft SEIS) has been prepared in response to an application submitted to the NRC by Carolina Power & Light Company, doing business as Progress Energy Carolinas, Inc. (CP&L), to renew the OL for Shearon Harris Nuclear Power Plant, Unit 1 (HNP) for an additional 20 years under 10 CFR Part 54. This draft SEIS includes the NRC staff's analysis that considers and weighs the environmental impacts of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse impacts. It also includes the NRC staff's preliminary recommendation regarding the proposed action.

Regarding the 69 issues for which the GEIS reached generic conclusions, the NRC staff has not identified any information that is both new and significant for any issue that applies to HNP. In addition, the NRC staff determined that information provided during the scoping process did not call into question the conclusions in the GEIS. Therefore, the NRC staff concludes that the impacts of renewing the HNP OL would not be greater than impacts identified for these issues in the GEIS. For each of these issues, the NRC staff's conclusion in the GEIS is that the impact is of SMALL[a] significance (except for collective offsite radiological impacts from the fuel cycle and high-level waste and spent fuel, which were not assigned a single significance level).

Regarding the remaining 23 issues, those that apply to HNP are addressed in this draft SEIS. For each applicable issue, the NRC staff concludes that the significance of the potential environmental impacts of renewal of the OL would be SMALL. The NRC staff determined that information provided during the scoping process did not identify any new issue with a significant environmental impact.

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

Abstract

The NRC staff's preliminary recommendation is that the Commission determine that the adverse environmental impacts of license renewal for HNP are not so great that preserving the option of license renewal for energy-planning decision makers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the Environmental Report submitted by CP&L; (3) consultation with Federal, State, and local agencies; (4) the NRC staff's own independent review; and (5) the NRC staff's consideration of public comments received during the scoping process.

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EXECUTIVE SUMMARY

By letter dated November 14, 2006, Carolina Power and Light Company, doing business as Progress Energy Carolinas, Inc., (CP&L) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license (OL) for the Shearon Harris Nuclear Power Plant, Unit 1 (HNP) for an additional 20-year period. If the OL is renewed, State regulatory agencies and CP&L will ultimately decide whether the plant will continue to operate based on factors such as the need for power or other matters within the State's jurisdiction or the purview of the owners. If the OL is not renewed, then the plant must be shut down on or before the expiration date of the current OL, which is October 24, 2026.

The NRC has implemented Section 102 of the National Environmental Policy Act (NEPA), Title 42, Section 4321, of the *United States Code* (42 USC 4321) in Part 51 of Title 10 of the *Code of Federal Regulations* (10 CFR Part 51). In 10 CFR 51.20(b)(2), the Commission requires preparation of an Environmental Impact Statement (EIS) or a supplement to an EIS for renewal of a reactor OL. In addition, 10 CFR 51.95(c) states that the EIS prepared at the OL renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plant*s (GEIS), NUREG-1437, Volumes 1 and 2.[a]

Upon acceptance of the CP&L application, the NRC began the environmental review process described in 10 CFR Part 51 by publishing a Notice of Intent to prepare an EIS and conduct scoping. The NRC staff held public scoping meetings on April 18, 2007, in Apex, North Carolina, and conducted a site audit at HNP in June 2007. In the preparation of this draft supplemental environmental impact statement (SEIS) for HNP, the NRC staff reviewed the CP&L Environmental Report (ER) and compared it to the GEIS, consulted with other agencies, conducted an independent review of the issues following the guidance set forth in NUREG-1555, Supplement 1, *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*, and considered the public comments received during the scoping process. The public comments received during the scoping process are provided in Appendix A, Part 1, of this draft SEIS.

The NRC staff will hold two public meetings in Apex, North Carolina, in January 2008, to describe the preliminary results of the NRC environmental review, to answer questions, and to provide members of the public with information to assist them in formulating comments on this draft SEIS. When the comment period ends, the NRC staff will consider and address all of the

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

comments received. These comments will be addressed in Appendix A, Part 2, of the final SEIS.

This draft SEIS includes the NRC staff's preliminary analysis that considers and weighs the environmental effects of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures for reducing or avoiding adverse effects. It also includes the NRC staff's preliminary recommendation regarding the proposed action.

The Commission has adopted the following statement of purpose and need for license renewal from the GEIS:

> The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and, where authorized, Federal (other than NRC) decision makers.

The evaluation criterion for the NRC staff's environmental review, as defined in 10 CFR 51.95(c)(4) and the GEIS, is to determine

> ... whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decision makers would be unreasonable.

Both the statement of purpose and need and the evaluation criterion implicitly acknowledge that there are factors, in addition to license renewal, that will ultimately determine whether an existing nuclear power plant continues to operate beyond the period of the current OL.

NRC regulations (10 CFR 51.95[c][2]) contain the following statement regarding the content of SEISs prepared at the license renewal stage:

> The supplemental environmental impact statement for license renewal is not required to include discussion of need for power or the economic costs and economic benefits of the proposed action or of alternatives to the proposed action except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation. In addition, the supplemental environmental impact statement prepared at the license renewal stage need not discuss other issues not related to the environmental effects of the proposed action and the alternatives, or any aspect of the storage of spent fuel for the facility within the scope of the generic determination in § 51.23(a) ["Temporary storage of spent fuel after cessation of reactor operation–generic determination of no significant environmental impact"] and in accordance with § 51.23(b).

The GEIS contains the results of a systematic evaluation of the consequences of renewing an OL and operating a nuclear power plant for an additional 20 years. It evaluates 92 environmental issues using the NRC's three-level standard of significance—SMALL, MODERATE, or LARGE—developed using the Council on Environmental Quality guidelines. The following definitions of the three significance levels are set forth in footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B:

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

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

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

For 69 of the 92 issues considered in the GEIS, the analysis in the GEIS reached the following conclusions:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

These 69 issues were identified in the GEIS as Category 1 issues. In the absence of new and significant information, the NRC staff relied on conclusions in the GEIS for issues designated as Category 1 in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B.

Of the 23 issues that do not meet the criteria set forth above, 21 are classified as Category 2 issues requiring analysis in a plant-specific supplement to the GEIS. The remaining two issues, environmental justice and chronic effects of electromagnetic fields, were not categorized. Environmental justice was not evaluated on a generic basis and must be addressed in a plant-specific supplement to the GEIS. Information on the chronic effects of electromagnetic fields was not conclusive at the time the GEIS was prepared.

This draft SEIS documents the NRC staff's consideration of all 92 environmental issues identified in the GEIS. The NRC staff considered the environmental impacts associated with alternatives to license renewal and compared the environmental impacts of license renewal and the alternatives. The alternatives to license renewal that were considered include the no-action alternative (not renewing the OL for HNP), conservation alternative, and alternative methods of power generation. Based on projections made by the U.S. Department of Energy's Energy Information Administration (DOE/EIA), gas- and coal-fired generation appear to be the most likely power-generation alternatives if the power from HNP is replaced. These alternatives are evaluated assuming that the replacement power generation plant is located at either the HNP site or some other unspecified alternate location.

The NRC staff has an established process for identifying and evaluating the significance of any new information on the environmental impacts of license renewal. No information has been identified as being new and significant related to Category 1 issues that would call into question the conclusions in the GEIS. Similarly, no new environmental issues applicable to HNP were identified by the NRC staff through its review process or the public scoping process. Therefore, the NRC staff relies upon the conclusions of the GEIS for all Category 1 issues that are applicable to HNP.

CP&L's ER presents an analysis of the Category 2 issues that are applicable to HNP, plus environmental justice. The NRC staff has reviewed the CP&L analysis for each issue and has conducted an independent review of each issue plus environmental justice. Nine Category 2 issues are not applicable because they are related to plant design features or site characteristics not found at HNP. Three Category 2 issues are not discussed in this draft SEIS because they are specifically related to refurbishment. CP&L has stated that its evaluation of structures and components, as required by 10 CFR 54.21, did not identify any major plant refurbishment activities or modifications as necessary to support the continued operation of HNP, for the license renewal period. In addition, any replacement of components or additional inspection activities are within the bounds of normal plant component replacement and, therefore, are not expected to affect the environment outside of the bounds of the plant operations evaluated in the *Final Environmental Statement Related to Operation of Shearon Harris Nuclear Power Plant* (NRC 1983).

Eight Category 2 issues related to operational impacts and postulated accidents during the renewal term, as well as environmental justice and chronic effects of electromagnetic fields, are discussed in detail in this draft SEIS. Five of the Category 2 issues and environmental justice apply to both refurbishment and to operation during the renewal term and are only discussed in this draft SEIS in relation to operation during the renewal term. For all eight Category 2 issues and environmental justice, the NRC staff concludes that the potential environmental effects are of SMALL significance in the context of the standards set forth in the GEIS. In addition, the NRC staff determined that appropriate Federal health agencies have not reached a consensus on the existence of chronic adverse effects from electromagnetic fields. Therefore, no further evaluation of this issue is required. For severe accident mitigation alternatives (SAMAs), the NRC staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Based on its review of the SAMAs for HNP, and the plant improvements already made, the NRC staff concludes that several candidate SAMAs are potentially cost-beneficial. However, none of these SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

Mitigation measures were considered for each Category 2 issue. For most issues, current measures to mitigate the environmental impacts of plant operation were found to be adequate.

Cumulative impacts of past, present, and reasonably foreseeable future actions were considered, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. For purposes of this analysis, where the HNP license renewal impacts are deemed to be SMALL, the NRC staff concluded that these impacts would not result in significant cumulative impacts on potentially affected resources.

If the HNP OL is not renewed and the plant ceases operation on or before the expiration of its current OL, then the adverse impacts of likely power generating alternatives would not necessarily be smaller than those associated with continued operation of HNP. The impacts may be greater in some areas, depending on the alternatives selected.

The preliminary recommendation of the NRC staff is that the Commission determine that the adverse environmental impacts of license renewal for HNP are not so great that preserving the option of license renewal for energy planning decision makers would be unreasonable. This recommendation is based on (1) the analysis and findings in the GEIS; (2) the ER submitted by CP&L; (3) consultation with other Federal, State, and local agencies; (4) the NRC staff's own independent review; and (5) the NRC staff's consideration of public comments received during the scoping process.

ABBREVIATIONS/ACRONYMS

°	degree
AADT	average annual daily traffic
ac	acre(s)
AEO	Annual Energy Outlook
ALARA	as low as reasonably achievable
AQCR	Air Quality Control Region
AEC	Atomic Energy Commission
BTU	British thermal unit(s)
C	Celsius
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
cfs	cubic feet per second
Ci	curie(s)
cm	centimeter
CO	carbon monoxide
COL	Combined License
CP&L	Carolina Power and Light Company, doing business as Progress Energy Carolinas, Inc.
CTMU	cooling tower make-up (water)
CVCS	Chemical and Volume Control System
CWA	Clean Water Act
DAW	dry active waste
DOC	U.S. Department of Commerce
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EIA	Energy Information Administration
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ER	environmental report
ESA	Endangered Species Act
ESP	early site permit

F	Fahrenheit
FES	Final Environmental Statement
FR	Federal Register
ft	foot (feet)
ft^3	cubic foot (feet)
ft/s	feet (feet) per second
FWS	U.S. Fish and Wildlife Service
gal	gallon(s)
GEIS	generic environmental impact statement
gpm	gallons per minute
GWh	gigawatt-hour(s)
GWPS	Gaseous Waste Processing System
ha	hectare(s)
HEEC	Harris Energy and Environmental Center
HLW	high-level waste
HNP	Shearon Harris Nuclear Power Plant, Unit 1
in.	inch(es)
IGCC	integrated gasification combined-cycle
ISFSI	Independent Spent Fuel Storage Installation
IVM	Integrated Vegetation Management
J	joule
km	kilometer(s)
kV	kilovolt
kWh	kilowatt-hour
L	liter
LAER	Lowest achievable emissions rate
lb	pound(s)
LQG	large-quantity generator
LLMW	low-level mixed waste
LWPS	Liquid Waste Processing System
m	meter(s)

m^3	cubic meter(s)
MBq	megabecquerel
MFTDS	Modular Fluidized Transfer Demineralization System
MGD	million gallons per day
mGy	milligray
mi	mile(s)
min	minute(s)
MPa	megapascal
mrad	millirad
mrem	millirem
mSv	milliSievert
MT	metric ton(s)
MTHM	metric ton of heavy metal
MWe	megawatts-electric
MWh	megawatt hour
MWt	megawatts-thermal
NAAQS	National Ambient Air Quality Standards
NAS	National Academy of Sciences
NCDENR	North Carolina Department of Environmental and Natural Resources
NCEMPA	North Carolina Eastern Municipal Power Agency
NCNHP	North Carolina Natural Heritage Program
NCOSA	North Carolina Office of State Archaeology
NCWRC	North Carolina Wildlife Resources Commission
NEPA	National Environmental Policy Act of 1969
NESC	National Electrical Safety Code
NHPA	National Historic Preservation Act of 1966
NIEHS	National Institute of Environmental Health Sciences
NO_x	nitrogen oxides
NOAA	National Oceanic and Atmospheric Administration
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
ODCM	*Offsite Dose Calculation Manual*
OL	operating license
PCB	polychlorinated biphenyls

pCi	picocurie(s)
PDR	Public Document Room
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to 10 microns
POVR	power operated relief valve
ppm	parts per million
psig	pounds per square inch gage
radwaste	radioactive waste
RCS	Reactor Coolant System
rem	roentgen equivalent man
RCRA	Resource Conservation and Recovery Act
REMP	Radiological Environmental Monitoring Program
ROI	region of influence
ROW	right-of-way
RWST	Refueling Water Storage Tank
SAMA	severe accident mitigation alternative
SCR	selective catalytic reduction
SEIS	supplemental environmental impact statement
SHPO	State Historic Preservation Office
SNHA	significant natural heritage areas
SO_x	sulfur oxides
Sv	Sievert
SWPS	Solid Waste Processing System
USC	United States Code
USCB	U.S. Census Bureau
USGS	U.S. Geological Survey
UST	underground storage tank
WPB	Waste Processing Building
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION

Under the U.S. Nuclear Regulatory Commission's (NRC's) environmental protection regulations in Part 51 of Title 10 of the *Code of Federal Regulations* (10 CFR Part 51), which implement the National Environmental Policy Act of 1969 (NEPA), renewal of a nuclear power plant operating license (OL) requires the preparation of an environmental impact statement (EIS). In preparing the EIS, the NRC staff is required first to issue the statement in draft form for public comment and then issue a final statement after considering public comments on the draft. To support the preparation of the EIS, the NRC staff has prepared a *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).(1) The GEIS is intended to (1) provide an understanding of the types and severity of environmental impacts that may occur as a result of license renewal of nuclear power plants under 10 CFR Part 54, (2) identify and assess the impacts that are expected to be generic to license renewal, and (3) support 10 CFR Part 51 to define the number and scope of issues that need to be addressed by the applicants in plant-by-plant license renewal proceedings. Use of the GEIS guides the preparation of complete plant-specific information related to the OL renewal process.

Carolina Power & Light Company, doing business as Progress Energy Carolinas, Inc. (CP&L) operates the Shearon Harris Nuclear Power Plant, Unit 1 (HNP) in Wake County, North Carolina under OL NPF-63, which was issued by the NRC. This OL will expire on October 24, 2026. On November 14, 2006, CP&L submitted an application to the NRC to renew the HNP OL for an additional 20 years under 10 CFR Part 54. CP&L is a licensee for the purposes of its current OL and an applicant for the renewal of the OL. Pursuant to 10 CFR 54.23 and 51.53(c), CP&L submitted an Environmental Report (ER) (Progress Energy 2006b), in which CP&L analyzed the environmental impacts associated with the proposed license renewal action, considered alternatives to the proposed action, and evaluated mitigation measures for reducing adverse environmental effects.

This report is the plant-specific supplement to the GEIS (the supplemental EIS [SEIS]) for the CP&L license renewal application. This draft SEIS is a supplement to the GEIS because it relies, in part, on the findings of the GEIS. The NRC staff will also prepare a separate safety evaluation report in accordance with 10 CFR Part 54.

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(1) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

1.1 Report Contents

The following sections of this introduction (1) describe the background for the preparation of this draft SEIS, including the development of the GEIS and the process used by the NRC staff to assess the environmental impacts associated with plant operations during license renewal; (2) describe the proposed Federal action to renew the HNP OL; (3) discuss the purpose and need for the proposed action; and (4) present the status of CP&L's compliance with environmental quality standards and requirements that have been imposed by Federal, State, regional, and local agencies that are responsible for environmental protection.

The ensuing chapters of this draft SEIS closely parallel the contents and organization of the GEIS. Chapter 2 describes the site, power plant, and interactions of the plant with the environment. Chapters 3 and 4, respectively, discuss the potential environmental impacts of plant refurbishment and plant operation during the renewal term. Chapter 5 contains an evaluation of potential environmental impacts of plant accidents and includes consideration of severe accident mitigation alternatives. Chapter 6 discusses the uranium fuel cycle and solid waste management. Chapter 7 discusses decommissioning, and Chapter 8 discusses alternatives to license renewal. Finally, Chapter 9 summarizes the findings of the preceding chapters and draws conclusions about the adverse impacts that cannot be avoided, the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and the irreversible or irretrievable commitment of resources. Chapter 9 also presents the NRC staff's preliminary recommendation with respect to the proposed license renewal action.

Additional information is included in appendixes. Appendix A contains public comments related to the environmental review for license renewal and NRC staff responses to those comments. Appendixes B through G, respectively, list the following:

- The preparers of the supplement,
- The chronology of NRC staff's environmental review correspondence related to this draft SEIS,
- The organizations contacted during the development of this draft SEIS,
- CP&L's compliance status in Table E-1 (this appendix also contains copies of consultation correspondence prepared and sent during the evaluation process),
- GEIS environmental issues that are not applicable to HNP, and
- Severe accident mitigation alternatives (SAMAs).

1.2 Background

Use of the GEIS, which examines the possible environmental impacts that could occur as a result of renewing individual nuclear power plant OLs under 10 CFR Part 54, and the established license renewal evaluation process support the thorough evaluation of the impacts of renewal of OLs.

1.2.1 Generic Environmental Impact Statement

The NRC initiated a generic assessment of the environmental impacts associated with the license renewal term to improve the efficiency of the license renewal process by documenting the assessment results and codifying the results in the Commission's regulations. This assessment is provided in the GEIS, which serves as the principal reference for all nuclear power plant license renewal EISs.

The GEIS documents the results of the systematic approach that was taken to evaluate the environmental consequences of renewing the licenses of individual nuclear power plants and operating them for an additional 20 years. For each potential environmental issue, the GEIS (1) describes the activity that affects the environment, (2) identifies the population or resource that is affected, (3) assesses the nature and magnitude of the impact on the affected population or resource, (4) characterizes the significance of the effect for both beneficial and adverse effects, (5) determines whether the results of the analysis apply to all plants, and (6) considers whether additional mitigation measures would be warranted for impacts that would have the same significance level for all plants.

The NRC's standard of significance for impacts was established using the Council on Environmental Quality (CEQ) terminology for "significantly" (40 CFR 1508.27, which requires consideration of both "context" and "intensity"). Using the CEQ terminology, the NRC established three significance levels—SMALL, MODERATE, or LARGE. The definitions of the three significance levels are set forth in the footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, as follows:

> SMALL - Environmental effects are not detectable or are so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
>
> MODERATE - Environmental effects are sufficient to alter noticeably, but not to destabilize, important attributes of the resource.
>
> LARGE - Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.

The GEIS assigns a significance level to each environmental issue, assuming that ongoing mitigation measures would continue.

The GEIS includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues are assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required in this draft SEIS unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria of Category 1, and therefore, additional plant-specific review for these issues is required.

In the GEIS, the NRC staff assessed 92 environmental issues and determined that 69 qualified as Category 1 issues, 21 qualified as Category 2 issues, and 2 issues were not categorized. The two uncategorized issues are environmental justice and chronic effects of electromagnetic fields. Environmental justice was not evaluated on a generic basis in the GEIS and must be addressed in the draft SEIS. Information on the chronic effects of electromagnetic fields was not conclusive at the time the GEIS was prepared.

Of the 92 issues, 11 are related only to refurbishment, 6 are related only to decommissioning, 67 apply only to operation during the renewal term, and 8 apply to both refurbishment and operation during the renewal term. A summary of the findings for all 92 issues in the GEIS is codified in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B.

1.2.2 License Renewal Evaluation Process

An applicant seeking to renew its OL is required to submit an ER as part of its application. The license renewal evaluation process involves careful review of the applicant's ER and assurance that all new and potentially significant information not already addressed in or available during the GEIS evaluation is identified, reviewed, and assessed to verify the environmental impacts of the proposed license renewal.

In accordance with 10 CFR 51.53(c)(2) and (3), the ER submitted by the applicant must

- Provide an analysis of the Category 2 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, in accordance with 10 CFR 51.53(c)(3)(ii), and

- Discuss actions to mitigate any adverse impacts associated with the proposed action and environmental impacts of alternatives to the proposed action.

In accordance with 10 CFR 51.53(c)(2), the ER does not need to

- Consider the economic benefits and costs of the proposed action and alternatives to the proposed action except insofar as such benefits and costs are either (1) essential for making a determination regarding the inclusion of an alternative in the range of alternatives considered, or (2) relevant to mitigation.

- Consider the need for power and other issues not related to the environmental effects of the proposed action and the alternatives.

- Discuss any aspect of the storage of spent fuel within the scope of the generic determination in 10 CFR 51.23(a) in accordance with 10 CFR 51.23(b).

- Contain an analysis of any Category 1 issue unless there is significant new information on a specific issue—this is pursuant to 10 CFR 51.23(c)(3)(iii) and (iv).

New and significant information is (1) information that identifies a significant environmental issue not covered in the GEIS and codified in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, or (2) information that was not considered in the analyses summarized in the GEIS and that leads to an impact finding that is different from the finding presented in the GEIS and codified in 10 CFR Part 51.

In preparing to submit its application to renew the HNP OL, CP&L developed a process to ensure that information not addressed in or available during the GEIS evaluation regarding the environmental impacts of license renewal for HNP would be properly reviewed before submitting the ER, and to ensure that such new and potentially significant information related to renewal of the license would be identified, reviewed, and assessed during the period of NRC review. CP&L reviewed the Category 1 issues that appear in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, to verify that the conclusions of the GEIS remained valid with respect to HNP. This review was performed by personnel from CP&L and its support organizations involved in the preparation of a license renewal ER.

The NRC staff also has a process for identifying new and significant information. That process is described in detail in *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*NUREG-1555, Supplement 1 (NRC 2000).

The search for new information includes (1) review of an applicant's ER and the process for discovering and evaluating the significance of new information, (2) review of public comments, (3) review of environmental quality standards and regulations, (4) coordination with Federal, State, and local environmental protection and resource agencies, and (5) review of the technical literature. New information discovered by the NRC staff is evaluated for significance using the criteria set forth in the GEIS. For Category 1 issues where new and significant information is identified, reconsideration of the conclusions for those issues is limited in scope to the assessment of the relevant new and significant information; the scope of the assessment does not include other facets of the issue that are not affected by the new information.

Chapters 3 through 7 discuss the environmental issues considered in the GEIS that are applicable to HNP. At the beginning of the discussion of each set of issues, a table identifies the issues to be addressed and lists the sections in the GEIS where the issue is discussed. Category 1 and Category 2 issues are listed in separate tables. For Category 1 issues for which there is no new and significant information, the table is followed by a set of short paragraphs that state the GEIS conclusion codified in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, followed by the NRC staff's analysis and conclusion. For Category 2 issues, in addition to the list of GEIS sections where the issue is discussed, the tables list the subparagraph of 10 CFR 51.53(c)(3)(ii) that describes the analysis required and the draft SEIS sections where the analysis is presented. The draft SEIS sections that discuss the Category 2 issues are presented immediately following the table.

The NRC prepares an independent analysis of the environmental impacts of license renewal and compares these impacts with the environmental impacts of alternatives. The evaluation of the CP&L license renewal application began with publication of a Notice of Acceptance for docketing in the *Federal Register* (FR; 72 FR 1562 [NRC 2007a]) on January 12, 2007. The NRC staff published a Notice of opportunity for Hearing and Intent to prepare an EIS and conduct scoping in the *Federal Register* (72 FR 13139 [NRC 2007b]) on March 20, 2007. Two public scoping meetings were held on April 18, 2007, in Apex, North Carolina. Comments received during the scoping period were summarized in the *Environmental Scoping Summary Report Associated with the Staff's Review of the Shearon Harris Nuclear Power Plant License Renewal Application* (NRC 2007c). Comments that are applicable to this environmental review are presented in Appendix A.

The NRC staff used the review guidance contained NUREG-1555, Supplement 1 (NRC 2000). The NRC staff and contractors retained to assist the staff visited the HNP site on June 5 and 6, 2007, to gather information and to become familiar with the site and its environs. The NRC staff also reviewed the comments received during scoping and consulted with Federal, State, regional, and local agencies. A list of the organizations consulted is provided in Appendix D. Other documents related to HNP were reviewed and are referenced in this draft SEIS.

This draft SEIS presents the NRC staff's analysis that considers and weighs the environmental effects of the proposed renewal of the OL for HNP, the environmental impacts of alternatives to license renewal, and mitigation measures available for reducing or avoiding adverse environmental effects. Chapter 9, "Summary and Conclusions," provides the NRC staff's preliminary recommendation to the Commission on whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy-planning decision makers would be unreasonable.

A 75-day comment period on this draft SEIS will begin on the date of publication in the *Federal Register* of the U.S. Environmental Protection Agency Notice of Availability of the draft SEIS to allow members of the public to comment on the preliminary results of the NRC staff's review. During this comment period, two public meetings will be held in Apex, North Carolina, in January 2008. During these meetings, the NRC staff will describe the preliminary results of the NRC environmental review and answer questions to provide members of the public with information to assist them in formulating their comments.

1.3 The Proposed Federal Action

The proposed Federal action is renewal of the OL for HNP. HNP is located in the southwest corner of Wake County, North Carolina, on the northwest shore of the 1680 ha (4150-ac) Harris Reservoir, approximately 25.8 km (16 mi) northeast of the city of Raleigh, North Carolina. HNP is a single-unit plant with a pressurized light-water reactor designed and manufactured by Westinghouse Electric Company, with a rated power level of 2900 megawatts thermal (MWt) and a gross power output of 955 megawatts electric (MWe). Plant cooling is provided by a closed-cycle system with a cooling tower-based heat dissipation system. The current OL for HNP expires on October 24, 2026. By letter dated November 14, 2006, CP&L submitted an application to the NRC to renew this OL for an additional 20 years of operation (Progress Energy 2006a).

1.4 The Purpose and Need for the Proposed Action

Although a licensee must have a renewed license to operate a reactor beyond the term of the existing OL, the possession of that license is just one of a number of conditions that must be met for the licensee to continue plant operation during the term of the renewed license. Once an OL is renewed, State regulatory agencies and the owners of the plant will ultimately decide whether the plant will continue to operate based on factors such as the need for power or other matters within the State's jurisdiction or the purview of the owners.

Thus, for license renewal reviews, the NRC has adopted the following definition of purpose and need (GEIS Section 1.3):

> The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and where authorized, Federal (other than NRC) decision makers.

This definition of purpose and need reflects the Commission's recognition that, unless there are findings in the safety review required by the Atomic Energy Act of 1954 or findings in the NEPA environmental analysis that would lead the NRC to reject a license renewal application, the NRC does not have a role in the energy-planning decisions of State regulators and utility officials as to whether a particular nuclear power plant should continue to operate. From the perspective of the licensee and the State regulatory authority, the purpose of renewing an OL is to maintain the availability of the nuclear plant to meet system energy requirements beyond the current term of the plant's license.

1.5 Compliance and Consultations

CP&L is required to hold certain Federal, State, and local environmental permits, as well as meet relevant Federal and State statutory requirements. In its ER, CP&L provided a list of the authorizations from Federal, State, and local authorities for current operations as well as environmental approvals and consultations associated with HNP license renewal. Authorizations and consultations relevant to the proposed OL renewal action are included in Appendix E.

The NRC staff has reviewed the list and consulted with the appropriate Federal, State, and local agencies to identify any compliance or permit issues or significant environmental issues of concern to the reviewing agencies. These agencies did not identify any new and significant environmental issues. The ER states that CP&L is in compliance with applicable environmental standards and requirements for HNP.

1.6 References

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. *Code of Federal Regulations*, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

40 CFR Part 1508. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 1508, "Terminology and Index."

Atomic Energy Act of 1954 (AEA). 42 USC 2011, et seq.

Progress Energy Carolinas Inc., (Progress Energy). 2006a. *Transmittal of Shearon Harris Nuclear Power Plant, Application for Renewal of Operating License.* Raleigh, North Carolina. Accessible at ML063350267.

Progress Energy Carolinas Inc., (Progress Energy). 2006b. Shearon Harris Unit 1, *Applicant's Environmental Report, Operating License Renewal Stage.* Raleigh, North Carolina. Accessible at ML063350276.

National Environmental Policy Act of 1969 (NEPA). 42 USC 4321, et seq.

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants.* NUREG-1437, Volumes 1 and 2. Office of Nuclear Regulatory Research, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants Main Report,* "Section 6.3 – Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants, Final Report." NUREG-1437, Volume 1, Addendum 1. Office of Nuclear Regulatory Research, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2000. *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal*. NUREG-1555, Supplement 1. Office of Nuclear Reactor Regulation, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2007a. "Notice of Acceptance for Docketing of the Application for Facility Operating License No. NPF-63 for an Additional 20-Year Period; Carolina Power & Light Company, Shearon Harris Nuclear Power Plant, Unit 1." *Federal Register*: Vol. 72, No. 8, pp. 1562-1563. January 12, 2007. Accessible at ML071730450.

U.S. Nuclear Regulatory Commission (NRC). 2007b. "Notice of Opportunity for Hearing, and Notice of Intent to Prepare an Environmental Impact Statement and Conduct the Scoping Process for Facility Operating License No. NPF-63 for an Additional 20-Year Period; Carolina Power & Light Company, Shearon Harris Nuclear Power Plant, Unit 1." *Federal Register*: Vol. 72, No. 53, pp. 13139-13142. March 20, 2007. Accessible at ML070790140.

U.S. Nuclear Regulatory Commission (NRC). 2007c. *Environmental Scoping Summary Report Associated with the Staff's Review of the Shearon Harris Nuclear Power Plant License Renewal Application.* Washington, D.C. Accessible at ML071980195.

2.0 DESCRIPTION OF NUCLEAR POWER PLANT AND SITE AND PLANT INTERACTION WITH THE ENVIRONMENT

Shearon Harris Nuclear Power Plant (HNP) is located in Wake County, North Carolina. HNP is a single-unit plant with a pressurized light-water reactor that employs a cooling tower-based heat dissipation system. HNP is operated by Carolina Power and Light Company, doing business as Progress Energy Carolinas, Inc. (CP&L). The plant and its environs are described in Section 2.1, and the environment in which the plant is located is presented in Section 2.2.

2.1 Plant and Site Description and Proposed Plant Operation During the Renewal Term

The HNP site is located on approximately 4370 hectares (ha) (10,800 acres [ac]) of land on the southwest corner of Wake County, North Carolina, on the northwest shore of the 1680-ha (4150-ac) Harris Reservoir, approximately 26 kilometers (km) (16 miles [mi]) northeast of the city of Raleigh, North Carolina. Figures 2-1 and 2-2 show the site location and features within 80 km (50 mi) and 10 km (6 mi), respectively.

2.1.1 External Appearance and Setting

The plant is located on a peninsula that extends into Harris Reservoir from the northwest. The Tom Jack Creek arm of the reservoir lies to the west; the Thomas Creek arm of the reservoir lies to the east. The reactor building and generating facilities lie within a nuclear exclusion area. The exclusion area, composed of both high ground and portions of Harris Reservoir, encompasses approximately 1430 ha (3535 ac) (Figure 2-3). The HNP site is a much larger tract of land that includes the exclusion zone, Harris Reservoir, and some surrounding lands totaling approximately 4370 ha (10,800 ac) (Progress Energy 2006b).

Of the 4370 ha (10,800 ac) that compose the HNP site, approximately 1680 ha (4150 ac) were inundated between 1980 and 1983, which created the Harris Reservoir. A second, smaller impoundment, the auxiliary reservoir, was created by damming the Tom Jack Creek arm of Harris Reservoir. This 130 ha (321 ac) reservoir was created to serve as a second source of water for the emergency service water system (Progress Energy 2006b).

Approximately 400 ha (1000 ac) of vegetation were cleared during development and construction of the HNP site. Most borrow areas and laydown yards were planted with pines in 1981 and 1982. Approximately 180 ha (440 ac) of the site were cleared and graded and are now occupied by generating facilities, parking lots, warehouses, equipment storage and laydown areas. Most of the remaining acreage, 2000 to 2500 ha (5000 to 6000 ac), is forested (Progress Energy 2006b).

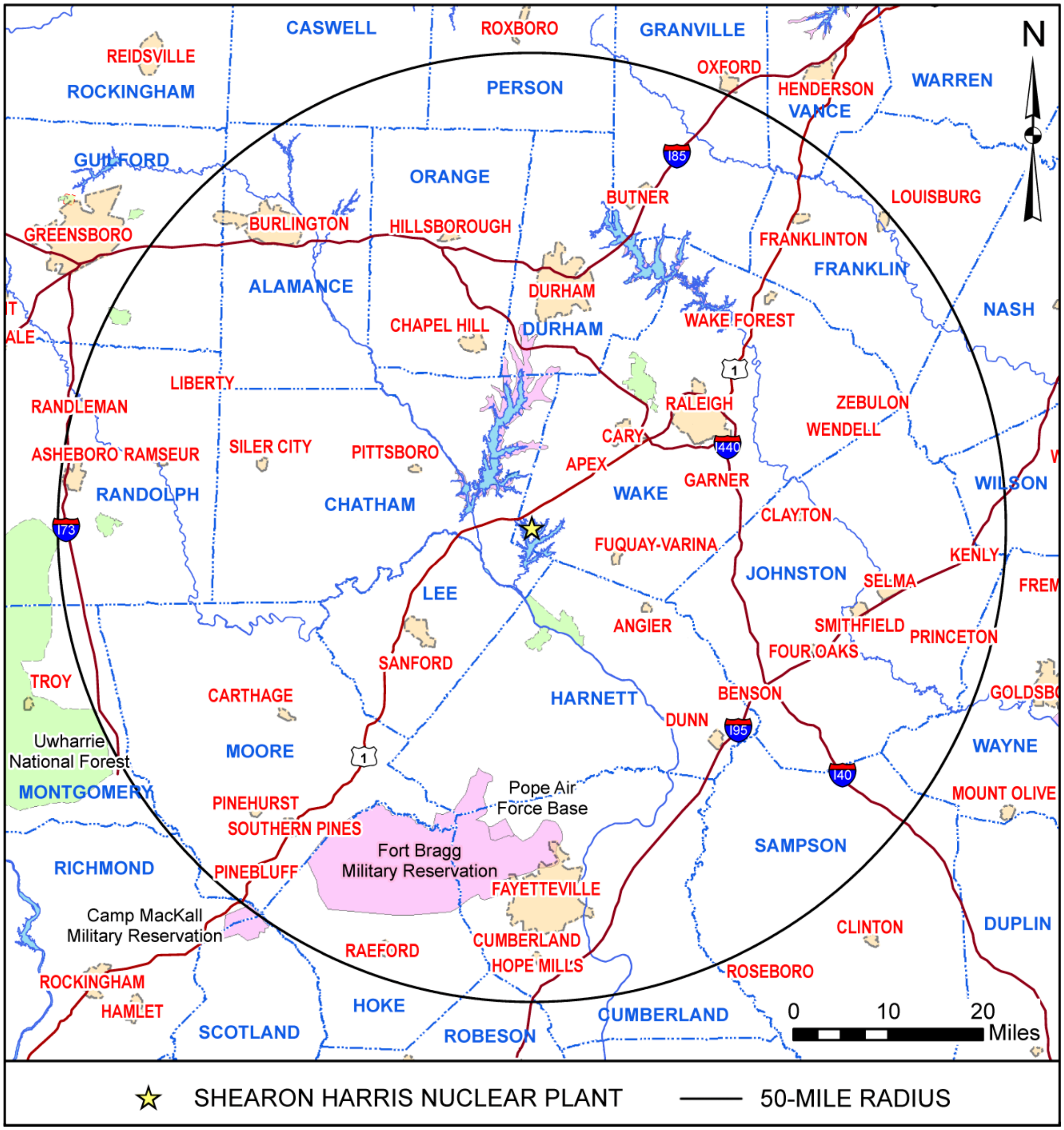

Figure 2-1. Location of HNP and Surrounding Area within an 80-km (50-mi) Radius (Progress Energy 2006b)

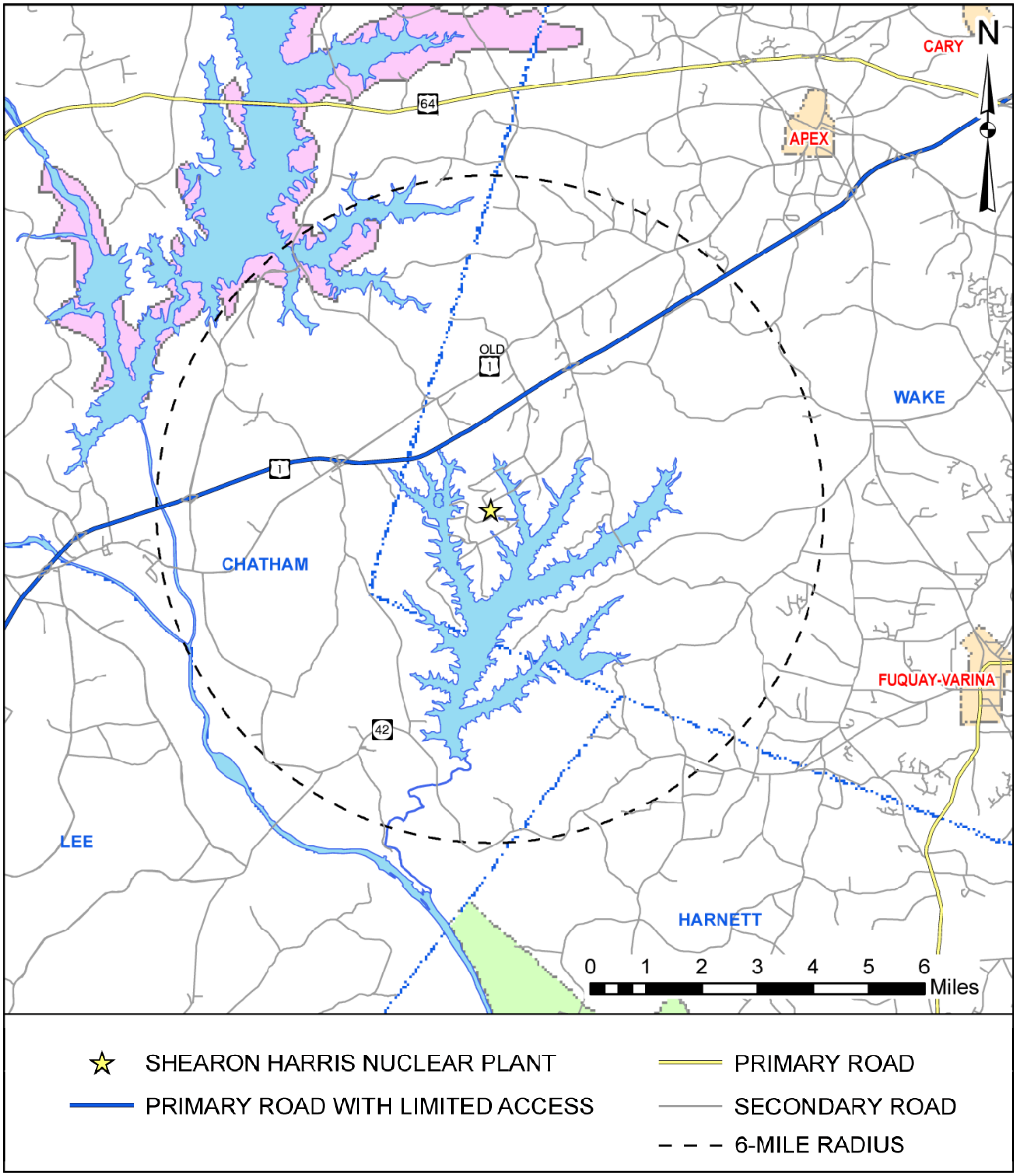

Figure 2-2. Location of HNP and Surrounding Area within a 10-km (6-mi) Radius (Progress Energy 2006b)

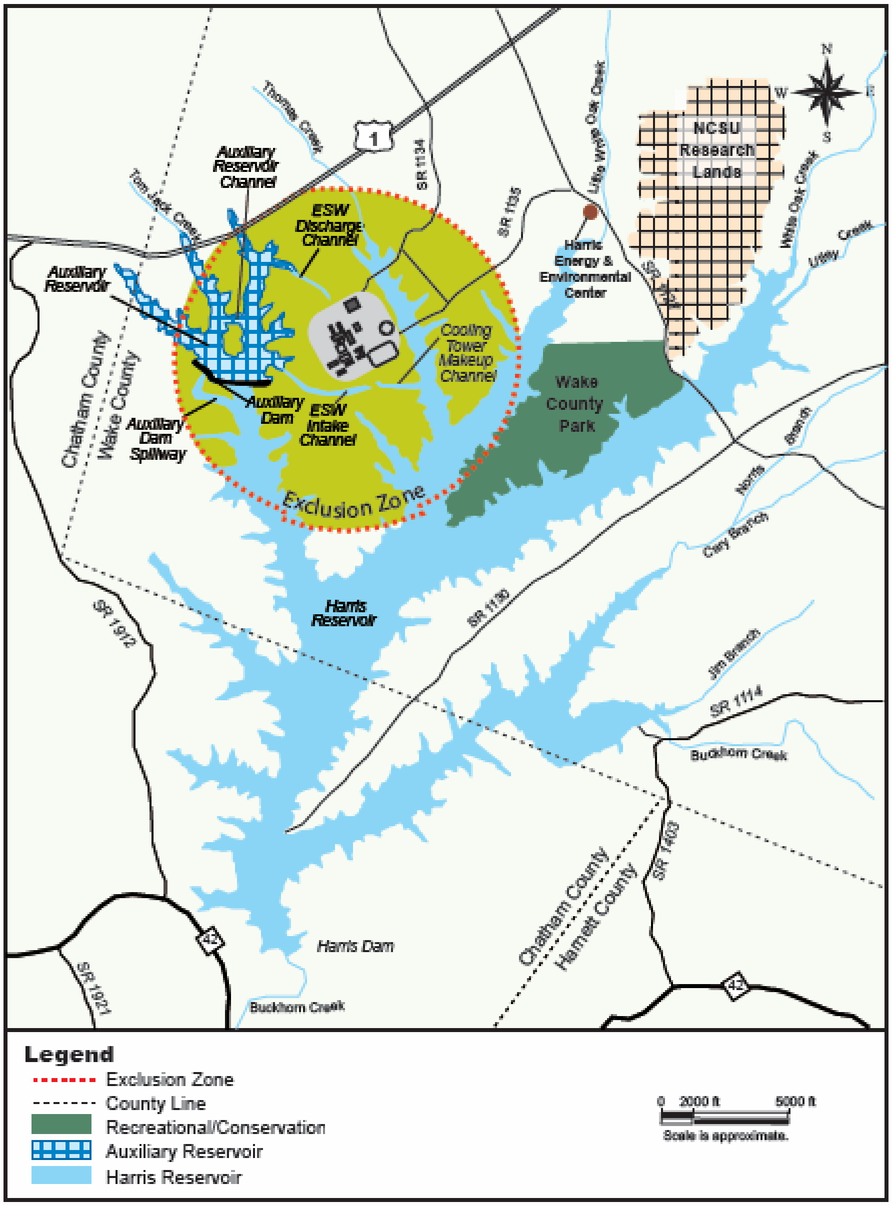

Figure 2-3. HNP Site and Harris Reservoir

2.1.2 Reactor Systems

HNP is a single-unit plant with a conventional domed concrete containment building. The plant includes a pressurized light-water reactor nuclear steam supply system and turbine generator designed and manufactured by Westinghouse Electric Company. The plant achieved initial criticality on January 3, 1987, and began commercial operation on May 2, 1987.

The reactor containment structure is a steel-lined, reinforced-concrete cylindrical structure capped with a hemispheric dome designed to withstand internal pressure of 0.310 MPa (45 psig) above atmospheric pressure (AEC 1973). The walls of the containment structure are 1.4 m (4.5 ft) thick. With its engineered safety features, the reinforced-concrete containment structure (reactor building) is designed to withstand severe weather conditions (e.g., tornadoes and hurricanes) and to provide radiation protection during both normal operations and design-basis accidents (Progress Energy 2006b).

Figure 2-4 shows the plant layout, including the location of the reactor building, the turbine building, the control building, and the waste processing building.

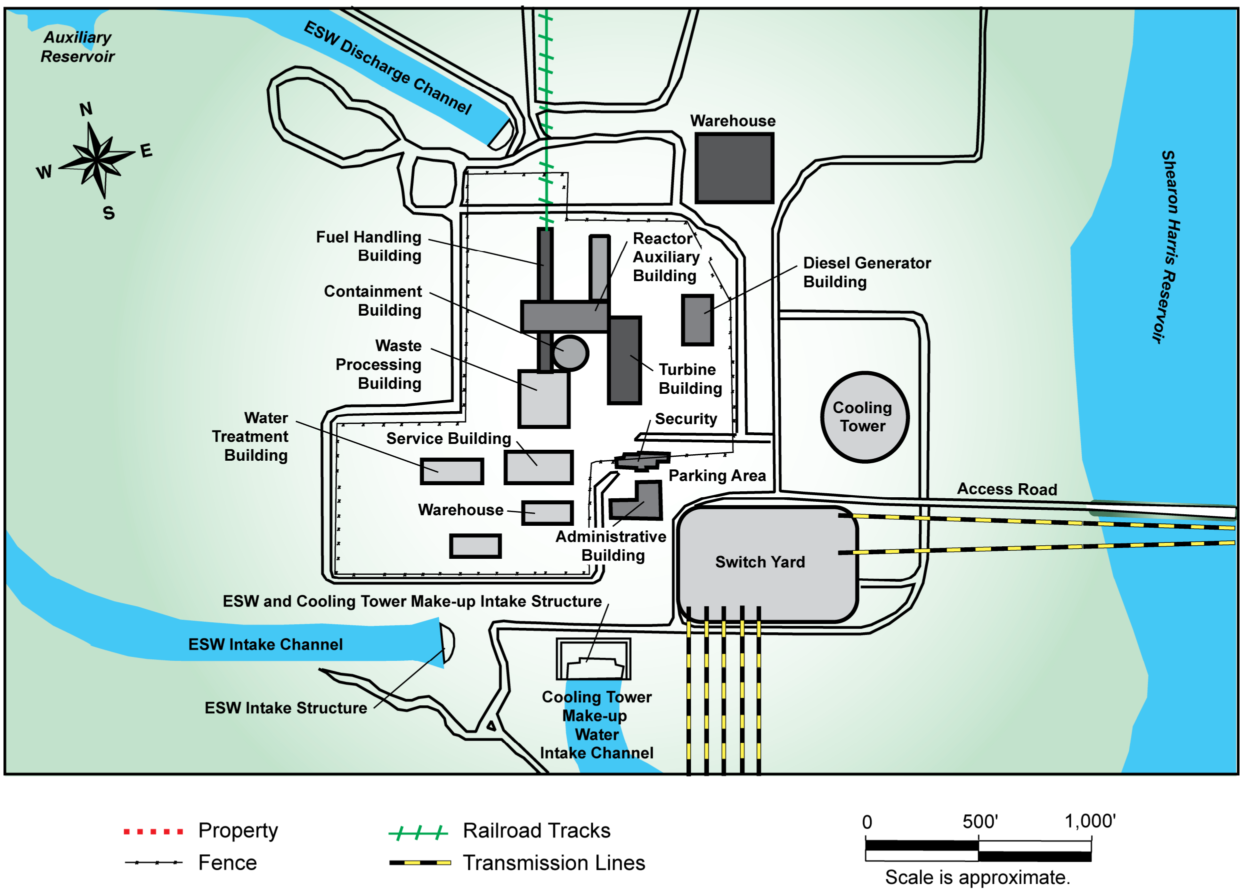

Figure 2-4. Harris Nuclear Power Plant Powerblock Area

Originally, HNP was built and operated at the design rating of 2775 megawatts thermal (MWt), producing an output of approximately 860 megawatts electric (MWe). On October 16, 2001, NRC approved an increase in the licensed maximum core thermal level of HNP from 2775 MWt to 2900 MWt, an increase of approximately 4.5 percent (NRC 2001). This, in turn, resulted in electrical ratings of 955 MWe (gross) and 900 MWe (net) (Progress Energy 2006b). The 4.5 percent power uprate for HNP was carried out during an extended outage for refueling and steam generator replacement that began in late September 2001 and ended in early January 2002 (Progress Energy 2006a).

HNP was designed originally for four reactors and four spent fuel storage pools, but only one reactor was built. However, the plant's fuel handling building has four spent fuel pools, as originally designed. The NRC operating license for HNP that was issued in 1987 authorized CP&L to use two of the four pools for storage of spent fuel from HNP and the company's other nuclear units: Brunswick, Units 1 and 2, and H. B. Robinson. In December 1998, CP&L asked the NRC for a license amendment that would allow the other two spent fuel pools to be placed in service. The spent fuel pool expansion was approved in December 2000 (NRC 2000).

Over the next several years, spent fuel from the Brunswick and Robinson plants was shipped to HNP in CP&L-owned, NRC-licensed casks on dedicated railroad trains. The shipping routes were NRC-approved and CP&L provided notification to appropriate state officials, as required by the Code of Federal Regulations.

CP&L shipped spent fuel from the Robinson Plant to HNP until 2004 when ground was broken for an Independent Spent Fuel Storage Installation (ISFSI) at the Robinson Plant. The ISFSI was completed in 2005, and the initial load of spent fuel was placed in storage in August of that year. Shipments of spent nuclear fuel from the Brunswick Plant to HNP are expected to end in 2008. The NRC license for the casks was extended from 2005 until 2008.

2.1.3 Cooling And Auxiliary Water Systems

HNP uses a closed-cycle heat dissipation system with a natural-draft cooling tower for its single unit. Unless otherwise noted, the discussion of the cooling-water system is adapted from the Environmental Report (ER) (Progress Energy 2006b), or information was gathered at NRC's site audit.

On the eastern side of HNP, cooling tower makeup (CTMU) water is withdrawn from either the Harris Reservoir, or the auxiliary reservoir by way of intake channels. Two intake structures can withdraw this water. The first intake structure houses both CTMU water pumps and non-recirculating emergency service water pumps. The second intake structure contains the non-recirculating emergency service water pumps.

Two pumps, each rated at 26,000 gallons per minute (gpm), located within the main intake structure, withdraw CTMU water after it passes through trash bars that remove large debris. Under normal operation, only one pump is needed to supply makeup water to replace losses to evaporation and blowdown. In times of drought, the makeup water pumps can also transfer water to the auxiliary reservoir. These pump bays are equipped with traveling screens that have a mesh size of 3/8 in. and rotate as needed. The approach velocity for these screens is 9 m/sec

(0.5 ft/sec). Any debris caught on the screens falls into a trough, leading to a bucket, which is cleared out as necessary.

Within each of the two intake structures, there are two emergency service water pumps. Each of these pumps is rated at 20,000 gpm. These pumps are tested at regular intervals to ensure reliable operation. These pumps are equipped with traveling screens that have a mesh size of 7/16 in. When the emergency pumps are in operation for testing, these screens rotate continuously. The approach velocity for these screens is 9.1 m/s (0.5 ft/s).

Three pumps, each rated at 161,000 gpm, circulate water into the main condenser. Chlorine is injected three times a day to prevent biofouling in the pipes. In addition, two pumps, each rated at 25,000 gpm, supply service water to the power plant. Under normal operating conditions, the total rated capacity of the cooling water system is 533,000 gpm.

After the cooling water passes through the condenser, it is then transferred to a hyperbolic natural-draft cooling tower. The 159 m (523 ft) tall cooling tower can remove 6.7 x 10^9 British thermal units per hour (BTU/hr) of excess heat to lower the water temperature by up to 14°C (25°F). 900 L/min (240 gpm) of water in the cooling loop are lost due to evaporation from the cooling tower. An additional 15 million L/day (4 million gal/day) (about 10,600 L/min [2800 gpm]) are lost to blowdown. This water is replaced by the makeup water from the Harris Reservoir.

HNP discharges blowdown and wastewater through seven permitted outfalls as described in Section 2.2.3.1. All wastewater streams at HNP from outfalls 001 through 005 are combined into outfall 006 and discharged through a 91-cm (36-in.) diameter pipe in the southern portion of the Harris Reservoir at a depth of 12 m (40 ft). The sewage treatment plant effluent from the Harris Energy and Environmental Center is discharged through outfall 007 in the northern neck of the reservoir. No discharges are sent to the auxiliary reservoir.

2.1.4 Radioactive Waste Management Systems and Effluent Control Systems

HNP radioactive waste (radwaste) systems are designed to collect and treat radioactive materials that are produced as a byproduct of plant operations. The design objective for the radwaste systems is to provide equipment, instrumentation, and operating procedures such that the discharge of radioactivity from the plant will not exceed the limits set forth in 10 CFR Part 20. Furthermore, the radwaste systems are designed and operated to meet the dose design objectives of 10 CFR Part 50, Appendix I, to meet the criterion of “as low as reasonably achievable (ALARA).” Section 3.8.1.1 of the GEIS (NRC 1996) provides a summary of regulatory requirements and specific numerical dose limits.

Liquid, solid, and gaseous waste processing systems are housed in the Waste Processing Building (WPB), which is located just southwest of the containment building. The WPB is a reinforced-concrete, seismic Category I structure, with cast-in-place, reinforced-concrete exterior walls and interior shear walls.

Radioactive waste material results from both the fission of uranium-235 fuel and from neutron activation of materials in the reactor systems. Radioactive fission products build up within the fuel pellets and migrate into the space that is outside the pellets, but within the sealed fuel rods. However, small quantities of fission products migrate from the fuel rods into the reactor coolant. Neutron activation of trace concentrations of metals entrained in reactor coolant such as iron and cobalt creates radioactive isotopes of these metals. Both fission and activation products in liquid and gaseous forms are removed continuously from the reactor coolant by being captured on filter media or by demineralization.

When a certain percentage of the fuel in a fuel rod assembly has been exhausted (i.e., fissioned), it is called spent fuel, and the spent fuel rod assembly is removed from the reactor core for disposal. Spent fuel assemblies are removed from the reactor core during reactor shutdown periods, and they are stored in a spent fuel pool.

HNP has developed procedures for the disposal of sanitary, solid, chemical, and radioactive wastes that are intended to reduce adverse impacts from these sources to levels that are acceptably low; however, a small operational impact will be present as long as the plant is in operation. Radioactive wastes are a product of plant operations. Long-term disposal of spent fuel and other solidified forms of radioactive materials must be considered.

HPN publishes an Annual Radiological Environmental Operating Report that contains data on the radiological impact of radioactive effluents on the environment based on the sampling of environmental media. In addition, the results from monitoring discharges of radioactive liquid and gaseous effluents are contained in an annual report entitled, *Shearon Harris Nuclear Power Plant, Annual Radioactive Effluent Release Report*. The HNP *Offsite Dose Calculation Manual* (ODCM) contains the methodology and parameters used in the calculation of off-site doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring alarm and trip set points, and in the conduct of the Radiological Environmental Monitoring Program (REMP). The ODCM also contains the radioactive effluent controls and radiological environmental monitoring activities and descriptions of the information that should be included in the Radiological Environmental Operating Program reports and in the Radioactive Effluent Release reports that are required by 10 CFR Part 50, Appendix I, and 10 CFR Part 50.36a.

2.1.4.1 Liquid Waste Processing Systems and Effluent Controls

Liquid radioactive wastes are collected, monitored, and processed by a combination of mechanisms, including holdup (permitting radioactive decay), filtration, demineralization, and ion-exchange treatment (removal of insoluble particulates and soluble contaminants), degassing (removal of dissolved gases), and evaporation (volume reduction). After processing, most of the liquids are recycled back into the primary coolant system or other liquid systems within the plant and reused. The remaining wet residues or concentrates are solidified and sent offsite for disposal.

Liquid waste from various equipment and floor drains and discharges from the reactor process and auxiliary systems is processed through the Liquid Waste Processing System (LWPS) that provides for the collection, storing, processing, and controlled release of radioactive and potentially radioactive liquids (Progress Energy 2006a). If sampling results show that liquid concentrations are sufficiently low, liquid waste may be released to the environment. The discharge of treated wastes is controlled and monitored to ensure that any discharges are ALARA and that they are in conformance with the requirements specified in 10 CFR Part 20 and 10 CFR Part 50, Appendix I (Progress Energy 2006a). The LWPS is designed to collect plant radioactive waste water and, by processing, reduce the radionuclide concentration to permit its discharge to the environs.

The Equipment Drain Treatment System is one of the main drainage systems that provide the interface between reactor auxiliary equipment and the waste processing treatment facilities. The Equipment Drain System provides both a means to control and process liquid waste as well as a means for capturing and transferring radioactive gases that escape from the liquid to the gaseous waste system. The Equipment Drain System and the Filter Backwash System are generally kept segregated from the other waste streams, since they tend to be higher in tritium concentration. Tritiated waste streams are processed using either the Modular Fluidized Transfer Demineralization System (MFTDS), direct evaporation, or both (Progress Energy 2006a). The waste material handled by the Floor Drain Treatment System, Laundry and Hot Shower System, and the Chemical Drain System have not differed to the point that separate processing has been necessary. (There are no floor drains connected to the radioactive Equipment Drain System, except in the Containment Building.)

The Filter Backwash System, a subsystem of the LWPS, backflushes designated flushable filters; then collects, stores, and transfers filtered sludge and particulates to the Solid Waste Processing System via the filter particulate concentrates tank.

The Secondary Waste Treatment System collects, stores, and processes both low conductivity and high conductivity waste water. Components of the waste material handled by the Secondary Waste Treatment System are not safety related and are not required to operate during a design basis accident (Progress Energy 2006a).

The HNP *Radioactive Effluent Release Reports* for the 5-year period from 2002 through 2006 were reviewed (Progress Energy 2003a, 2004a, 2005a 2006d, 2007a). No uncontrolled liquid releases to the environment were reported. Calculated doses in the HNP Radioactive Effluent Release Reports were very small for each year during the 5-year period with the highest dose of 1.86×10^{-4} mSv (0.0186 mrem) reported for 2004. Releases of radioactive liquids are expected to continue at approximately the same rate during the renewal period. According to the HNP *Radioactive Effluent Release Report for 2006*, the maximum individual offsite annual whole body dose from liquid effluents was calculated to be 5.95×10^{-5} mSv (5.95×10^{-3} mrem). Section 2.2.7 provides more discussion of the calculated doses to the maximally exposed individual as a result of radioactive liquid effluent releases.

Based on the system described above as well as the design and previous performance of the HNP plant, liquid effluents would be expected to be released in the similar amounts during the renewal period. Therefore, the resulting doses to members of the public would be expected to be below the dose design objectives in Appendix I to 10 CRF Part 50.

2.1.4.2 Gaseous Waste Processing Systems and Effluent Controls

The HNP Gaseous Waste Processing System (GWPS) is designed to collect, process, and store gaseous wastes that are generated by plant operations. All GWPS equipment is located inside the WPB, and all GWPS equipment is controlled from the WPB Control Room. The ten waste gas decay tanks of the gaseous radwaste system provide adequate off-gas holdup time to allow significant decay of the short-lived radionuclides (such as nitrogen-16 and oxygen-19), as well as the decay of short-lived isotopes of the fission product noble gases (primarily xenon and krypton). Nine of these tanks are used for normal operations while one is kept at a low pressure to collect relief valve discharges (Progress Energy 2006a). Storage of waste gas up to 90 days is provided by retention in a gas-decay tank. Hydrogen (some of which is the radioactive isotope tritium with a half-life of 12.32 years) is removed continuously by the hydrogen recombiner to form liquid water, and the water is processed by the LWPS.

The largest quantity of radioactive gas comes from the volume control tank. Smaller quantities of radioactive gas are received via the vent connections from the recycle evaporator gas stripper, the reactor coolant drain tank, the pressurizer relief tank, and the recycle holdup tank. (The waste evaporator will be vented to the GWPS when it is used as a recycle evaporator.) The GWPS system is designed to ensure that the calculated dose to members of the public from the release of gaseous effluents is in accordance with the dose design objectives of Appendix I to 10 CFR Part 50. The GWPS has sufficient capacity and redundancy to control releases such that the discharge(s) is within the limits of 10 CFR Part 20 (Progress Energy 2006a).

The GWPS conforms to the requirements of General Design Criterion 60 of Appendix A to 10 CFR Part 50 by providing both holdup and storage capacity. This design feature reduces the need for releasing radioactive effluents during unfavorable environmental conditions. The design features of the GWPS are based on continuous operation of the plant with the assumption that one percent of the rated core power is generated by fuel rods containing cladding defects and the assumption that this leaky condition exists over the lifetime of the plant.

The HNP Radioactive Effluent Release Reports for the 5-year period from 2002 through 2006 were reviewed (Progress Energy 2003a, 2004a, 2005a 2006d, 2007a). No unplanned gaseous effluent release occurred during 2002, one during 2003, seven during 2004, eight during 2005, and two during 2006. The calculated offsite doses were well below all administrative limits “for all vital organs” for each of the five years, and there was no indication that any of these releases required special reporting.

According to the HNP Radioactive Effluent Release Reports, the annual dose from the gaseous pathway is based on the highest calculated twelve-year annual average relative concentration and deposition factor for particulates at the most restrictive location on the site boundary. For 2006, the maximum individual offsite annual dose from gaseous effluents was calculated to be 7.40×10^{-7} mGy (7.40×10^{-5} mrad) from beta radiation and 7.18×10^{-7} mGy (7.18×10^{-5} mrad) from gamma radiation. The average maximum individual offsite annual dose from gaseous effluents for the 5-year period was calculated to be 3.10×10^{-6} mGy (3.10×10^{-4} mrad) from beta radiation and 1.19×10^{-6} mGy (1.19×10^{-4} mrad) from gamma radiation. Section 2.2.7 provides more discussion of the calculated doses to the maximally exposed individual as a result of radioactive gaseous effluent releases.

All gaseous effluent discharge paths are monitored for radioactivity, in compliance with General Design Criterion 64 of Appendix A to 10 CFR Part 50, to ensure that radioactivity concentrations do not exceed predetermined limits. If a limit is exceeded, discharge will be terminated automatically (Progress Energy 2006a).

2.1.4.3 Solid Waste Processing

The Solid Waste Processing System (SWPS) collects, controls, processes, packages, handles, and temporarily stores radioactive waste generated as a result of normal operation of the plant, including anticipated operational occurrences. Solid wastes include filter sludge, evaporator bottoms, spent resins, tools and equipment (that are either radioactive or contaminated with radioactive material), and miscellaneous radioactive wastes from plant and laboratory operations, maintenance, and cleanup operations. The objective of the Solid Waste Processing System is to convert radioactive wastes into packaged forms acceptable for offsite disposal as solid waste. In addition, the SWPS is to provide a reliable means for processing the material while minimizing radiation exposure to plant personnel and to the general public in compliance with the requirements of 10 CFR 20 and 10 CFR 50. The SWPS was designed to perform these functions without limiting the operation or availability of the plant. The original liquid waste processing equipment has been removed from service and placed in a lay-up condition. Although this equipment has been abandoned, solidification system equipment could be returned to service to process spent resins, filter sludges, and evaporator bottoms. There are also provisions for the use of vendor-supplied solidification or dewatering systems. The SWPS prepares waste material for transportation to an offsite disposal facility, and solid radioactive waste is shipped off-site in vehicles that are equipped with adequate shielding to comply with Department of Transportation (DOT) and NRC regulations. Provisions are made for the use of a Vendor Mobile Solid Waste Processing System (Progress Energy 2006a).

The Waste Processing Building (WPB) houses the SWPS, the Liquid Waste Processing System (LWPS), and the Gaseous Waste Processing System (GWPS). In addition, the WPB contains laboratories and personnel facilities. The WPB provides barriers against fire, flooding, water spray, high energy fluid release, and airborne objects. Tanks and processing equipment, which contain large quantities of radwaste, are shielded, and ventilation air flows from areas having low airborne radioactivity concentrations to areas that may have higher radioactivity concentrations (Progress Energy 2006a). Both of these design features are to help effect implementation of ALARA for personnel.

Process wastes originate in the LWPS, the Chemical and Volume Control System (CVCS), the Boron Thermal Regeneration System (BRS), and other HNP systems. Wet wastes that are generated during normal plant operations are dewatered or solidified. The SWPS is designed to hold one day of production of evaporator concentrates at normal generation rates before solidification is required. The SWPS receives process waste filter sludge, evaporator bottoms, and spent resins, and other solid radioactive wastes such as contaminated paper, cloth, construction materials, laboratory supplies, and other non-retrievable items such as those that are generated by normal operations of the plant (Progress Energy 2006a).

Dry active waste (DAW) processing is performed by an off-site vendor that uses an effective type of volume reduction for the various types of DAW shipped from the HNP. The DAW is collected in shipping containers that are retained on site until a sufficient quantity of waste has been collected for shipment. This waste is then shipped to an off-site DAW processing facility where it is processed, packaged for disposal, and ultimately shipped to the low-level waste disposal facility (Progress Energy 2006a). Transportation and disposal of solid radioactive wastes are performed in accordance with the applicable requirements of 10 CFR Part 20, 10 CFR Part 71, and 10 CFR Part 61 as well as applicable state regulations.

According to the *HNP Annual Radioactive Release Report for Year 2006* (Progress Energy 2007a), 7.4×10^3 MBq (0.2 Ci) of radioactivity in a volume of 0.927 m^3 (32.7 ft^3) was disposed from the HNP site in an approved shipping container in the form of Waste Class A spent resins. In the form of Waste Class A DAW, 58.1 m^3 (2052 ft^3) containing 4.51×10^5 MBq (12.2 Ci) of radioactivity was disposed from the HNP site during 2006. The majority of the disposed radioactivity was due to cobalt-60, iron-55, nickel-63, and cesium-137. No irradiated components, control rods, or other solid radioactive wastes were disposed from the HNP site during 2006. The total radioactivity disposed from HNP in the form of solid radioactive waste during 2006 was reported as 3.35×10^6 MBq (90.5 Ci), and most of this activity was associated with spent resins, filter sludges, and evaporator bottoms.

The average amount of radioactivity in solid radioactive waste that was disposed annually during the past 5 years was approximately 5.96×10^6 MBq (161 Ci).

2.1.5 Nonradioactive Waste Systems

Nonradioactive waste, such as nonhazardous waste, hazardous and universal waste, mixed waste, sanitary and industrial wastewater, sanitary sludges, and air emissions is generated at HNP from normal operations and plant maintenance. These waste streams are regulated by local and State agencies through permitting and compliance activities.

2.1.5.1 Nonradioactive Waste Streams

Nonhazardous waste, such as office trash, used oil, and kitchen waste, is generated as part of routine daily operations. From 2002 to 2006, approximately 150,000 kg (180 tons) to 300,000 kg (320 tons) of nonhazardous solid waste was generated and disposed of at the Wake County Landfill (Progress Energy 2007d). Two trash compactors are used to decrease the volume of trash prior to offsite disposal.

CP&L operated an unlined industrial landfill onsite until December 2003 for the disposal of wood, concrete, paint and paint waste, activated charcoal, industrial greases, and waste ion exchange resins. North Carolina Department of Environmental and Natural Resources (NCDENR) issued a letter of closure for the landfill in May 2005. As a condition of the State-approved Closure Plan, CP&L performs groundwater monitoring around the closed landfill. Section 2.2.3.2 provides more details on the groundwater monitoring program.

The Resource Conservation and Recovery Act (RCRA) established regulations regarding the treatment, storage, and/or disposal of hazardous waste. RCRA regulations are administered in North Carolina by the NCDENR (15A NCAC 13A.0100). HNP is a small-quantity hazardous waste generator (NCD 991278284), generating less than 1000 kg (2200 lb) of hazardous waste per month. From 2003 to 2006, approximately 500 kg (1100 lbs) of hazardous waste was generated annually. In 2002, approximately 2200 kg (5000 lb) of hazardous waste was generated.

Universal wastes are hazardous wastes that have been specified as a universal waste by the EPA. Universal wastes, including mercury-containing equipment, batteries, lamps, and pesticides, have specific regulations to ensure they are properly handled and treated (40 CFR Part 273). North Carolina has incorporated, by reference, the EPA's regulations regarding universal wastes (15A NCAC 13A.0119).

HNP is a small-quantity generator of universal waste, generating waste batteries, waste fluorescent lamps, waste mercury-containing equipment, and computer components from normal facility operations. The universal wastes are accumulated in satellite areas and then stored in a designated storage warehouse. The wastes are disposed of off-site by a contract service.

NCDENR conducts random compliance audits of HNP's nonradiological waste program. The last audit of HNP by NCDENR was in 2005 and no violations were noted.

The Emergency Planning and Community Right-to-Know Act (EPCRA), requires applicable facilities to provide information on hazardous and toxic chemicals to emergency planning authorities. HNP is subject to Federal EPCRA and North Carolina Right-to-Know Act reporting requirements and, therefore, submits annual Section 312 Tier II reports to local emergency agencies for substances such as resins, gases, sealants, antifreeze, and oils (Progress Energy 2007g).

Low-level mixed wastes (LLMW) are wastes that exhibit hazardous characteristics and contain low-levels of radioactivity (40 CFR 266). EPA (or the authorized state agency) regulates the hazardous component of the mixed waste through RCRA, and NRC regulates radioactive waste subject to the Atomic Energy Act. North Carolina has incorporated by reference federal regulations exempting LLMW from RCRA storage and treatment regulations provided the LLMW meets specific conditions (15A NCAC 13A.0111).

HNP accumulates LLMW, such as contaminated used oil or asbestos gaskets, during routine facility operation and maintenance. Although a small amount of mixed waste is accumulated at HNP, no LLMW has ever been shipped offsite for disposal. When it becomes necessary, a contract service would remove the LLMW from HNP and dispose of the waste at a permitted facility.

There are two State-permitted sewage treatment plants that treat sanitary waste from the HNP site and the Harris Environmental and Education Center (HEEC). Sludge is periodically removed from the HNP treatment plant, such as during outages, and either sent to the HEEC treatment plant or is removed by a contractor that land applies the sludge offsite. Wastewater from the HNP treatment is released to the Harris Reservoir through a National Pollutant Discharge Elimination System (NPDES) permitted outfall (Outfall No. 002). The HEEC sewage treatment plant also sends wastewater through an NPDES-permitted outfall (Outfall No. 007) to Harris Reservoir. More information regarding the NPDES permit and associated outfalls is provided in Section 2.2.3.1.

CP&L has procedures in place for the proper handling and disposal of biological waste according to Federal (29 CFR 1910.1030) and State (15A NCAC 13B.1200) regulations. Nonradioactive biological waste is to be taken to the In-Processing Facility for disposal. If the biological waste has a radiological component, it must still be marked as biological waste but removed by the radiological waste contractor.

Nonradioactive air pollutants are released into the atmosphere from the use of oil-fired burners and emergency diesel generators. HNP has a Synthetic Minor Air Permit (No. 08455Ro4) from the NCDENR, Division of Air Quality. More information about air emissions is provided in Section 2.2.4.

2.1.5.2 Pollution Prevention and Waste Minimization

CP&L has an active waste minimization program at HNP. Aluminum cans, antifreeze, batteries (non-universal waste), cardboard, oil, paper, printer cartridges, scrap metal, wood, pallets, and lighting are all recycled, diverting thousands of pounds of waste from the landfill.

The EPA's Office of Pollution Prevention and Toxics has established a clearinghouse that provides information regarding waste management and technical and operational approaches to pollution prevention. The EPA's clearinghouse can be used as a source for additional opportunities for waste minimization and pollution prevention at HNP, as appropriate.

Additionally, the NCDENR Division of Pollution Prevention and Environmental Assistance provides compliance resources, technical assistance, and training for industry on pollution prevention initiatives.

2.1.6 Plant Operation and Maintenance

Maintenance, inspection, testing, and surveillance activities are performed at HNP in order to satisfy the current licensing requirements for the facility and to ensure compliance with environmental and safety regulations. Some activities can be performed while the reactor is operating, but others require that the facility be shut down before they can be performed. Long-term outages are required for refueling and for certain types of repairs or maintenance activities, such as replacement of a major reactor system or major support system component. HNP is on a nominal 18-month refueling cycle (Progress Energy 2006b). During refueling outages, site employment increases above the permanent workforce by as many as 800 workers for temporary duty. Progress Energy has stated that no refurbishment is needed (Progress Energy 2006b); therefore, any employment increment during license renewal depends on the programs and activities that are required for managing the effects of aging.

Numerous maintenance, inspection, testing, and surveillance activities are conducted. Some of these are periodic (such as annually), while others are conducted on an as needed basis. Some of these activities can only be performed during a refueling outage. Inspections for abrasion, abnormal wear, signs of corrosion, material degradation, bent or damaged members, loose bolts/components, loose connections, broken welds, component performance, etc. are conducted (Progress Energy 2006b).

2.1.7 Power Transmission Lines

HNP is currently connected to the regional grid via seven 230-kV transmission lines in the HNP switchyard, all of which are owned, operated, and maintained by Progress Energy. The Final Environmental Statement (FES) for the construction of the HNP site (AEC 1973) and the FES for the operation of the HNP site (NRC 1983) discuss eight transmission lines intended to connect the HNP site with the regional transmission grid. Changes have been made to the transmission system since the publication of these FESs. Six of the eight lines discussed in the FESs were built, and one new line was added later during operation of HNP (Progress Energy 2006b). Additionally, the Apex-U.S. 1 line, discussed below, has been shortened. Transmission lines considered in scope for license renewal are those constructed to connect the facility to the transmission system (10 CFR 51.53(c)(3)(ii)(H)); a discussion of the seven in-scope transmission lines follows.

Four transmission lines (Siler City, Cape Fear North, Cape Fear South, and Fort Bragg–Woodruff Street) originate at the HNP switchyard and share a 110-m (350-ft) wide right-of-way (ROW) for 1.6 km (1 mi), located within the HNP site boundary. The Siler City and Fort Bragg–Woodruff Street transmission lines then split, each having a separate 30-m (100-ft) wide ROW.

The Cape Fear North and Cape Fear South transmission lines continue sharing a ROW, which is 30 m (100 ft) wide after the first mile. The remaining three transmission lines, Apex–U.S. 1, Erwin, and Wake, each have 30-m (100-ft) wide ROWs starting at HNP. Figure 2-5 shows the location of all seven transmission line ROWs.

Originating at the HNP switchyard, the 50-km (31-mi) long Siler City line runs south from the plant, and then west to a substation in Siler City. The 12-km (7.4-mi) long Cape Fear North line and 10-km (6.5-mi) long Cape Fear South line both extend from the HNP switchyard to the Cape Fear Plant. The Cape Fear Plant transmits electricity to the grid via these lines in the plant's switchyard. The lines also provide a source of power from the Cape Fear Plant to HNP for activities such as refueling. Therefore, the sections of the Cape Fear North and Cape Fear South lines that run from the Cape Fear Plant switchyard to HNP are considered in scope for this draft SEIS. The 58-km (36-mi) long Fort Bragg–Woodruff Street transmission line runs south from the plant to the Woodruff Street substation. A ROW remains along the stretch that formerly extended an additional 34 km (21 mi) to Fayetteville, North Carolina, and is considered out of scope for this draft SEIS. The Apex–U.S. 1 line extends 6 km (4 mi) northeast of HNP to a substation in Apex. The 48-km (30-mi) long Erwin transmission line, referred to in the FES for construction as the "Harris–Fuquay–Erwin North line," extends east of the HNP site to a substation near Erwin (AEC 1974). The 61-km (38-mi) long Wake transmission line runs northeast to a substation near Raleigh.

CP&L owns and operates 227 km (142 mi) of transmission lines and maintains 2747 ha (1717 ac) of ROWs associated with the transmission lines (Progress Energy 2006b). The transmission lines do not cross any Federal, state, or local parks, though the lines do cross land established and set aside for the North Carolina Game Lands program in four locations: Chatham Game Lands and Shearon Harris Game Lands to the south and southwest of HNP, and Shearon Harris Game Lands to the east and northeast of HNP (Progress Energy 2006b).

ROW vegetative maintenance practices use an Integrated Vegetation Management (IVM) approach that includes both mechanical and chemical control methods. Mechanical methods consist primarily of mowing, with supplementary pruning, felling, and hand trimming as needed. Mowing is completed on a 3-year cycle. Chemical control methods consist of application of EPA-approved herbicides and tree-growth-regulating chemicals (Progress Energy 2006b). CP&L staff aims spray away from streams and wetlands when applying chemicals to ROWs that cross those areas and performs flyover inspections three times each year to identify any vegetative interference with transmission lines. Procedures are in place to manage environmental incidents that might occur within the ROW, such as a chemical build-up in a wetland area. CP&L staff limits erosion around stream crossings and wetlands by using appropriate procedures and methods.

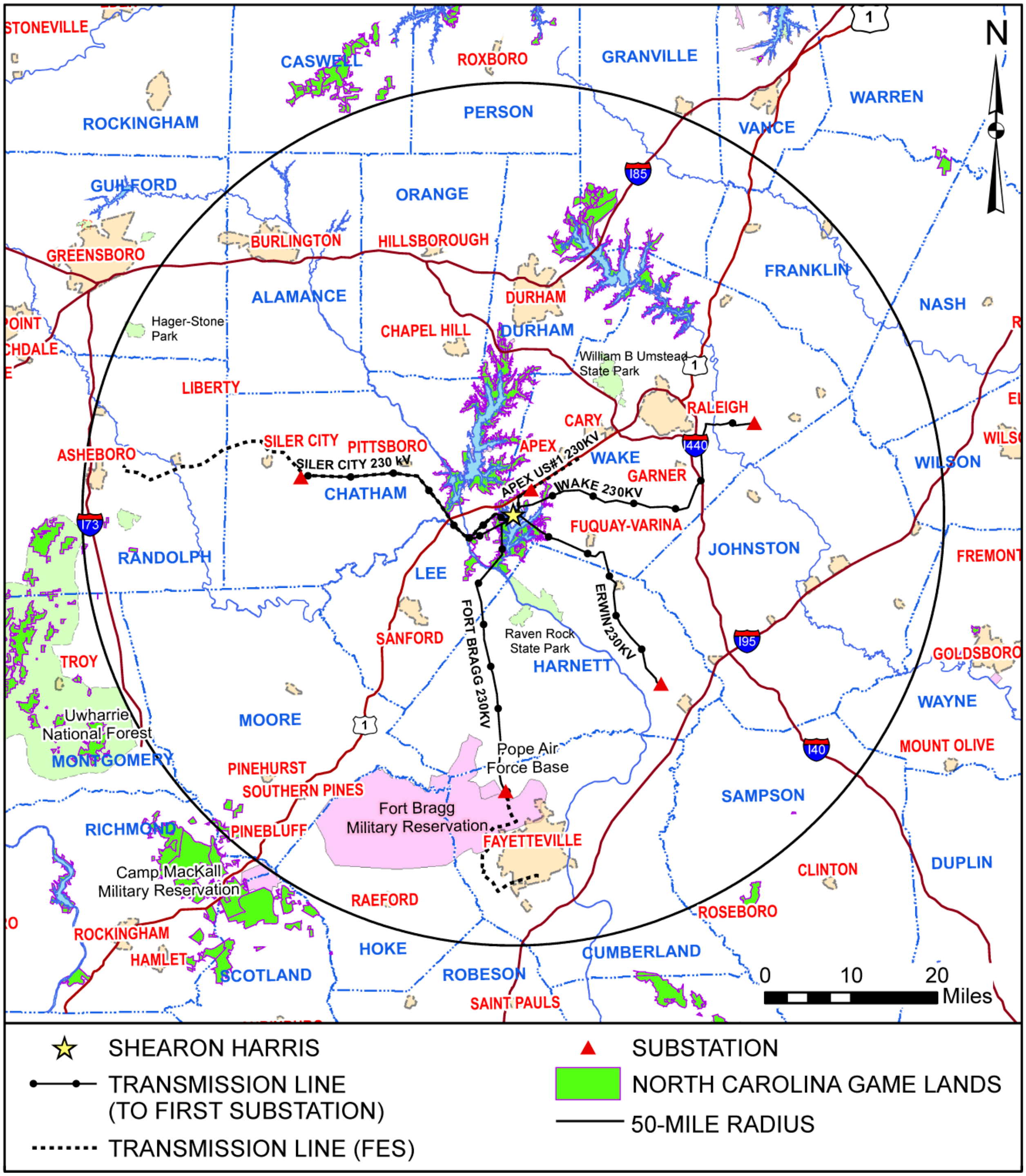

Figure 2-5. Map of Transmission Lines within 80-km (50-mi) Radius of HNP
(Progress Energy 2006b)

2.2 Plant Interaction with the Environment

Sections 2.2.1 through 2.2.8 provide general descriptions of the environment near HNP as background information. They also provide detailed descriptions where needed to support the analysis of potential environmental impacts of refurbishment and operation during the renewal term, as discussed in Chapters 3 and 4. Section 2.2.9 describes the historic and archaeological resources in the area, and Section 2.2.10 describes possible impacts associated with other Federal project activities.

2.2.1 Land Use

HNP is located primarily in the southwest corner of Wake County with a small portion of the site extending into southeastern Chatham County, North Carolina (Figure 2-1). The City of Raleigh is located approximately 26 km (16 mi) to the northeast of HNP and the City of Sanford is located approximately 24 km (15 mi) to the southwest (Figure 2-2). The Cape Fear River flows in a northwest-to-southeast direction approximately 11 km (7 mi) south of HNP (Figure 2-1).

In 1980, the Carolina Power & Light Company (CP&L) constructed a dam on Buckhorn Creek about 4 km (2.5 mi) north of its confluence with the Cape Fear River to create the Harris Reservoir, which is used for cooling tower makeup water. The HNP power block area, consisting of the reactor building, generating facilities, and switchyard, is located on a peninsula extending southeast into the Harris Reservoir; about 7 km (4.5 mi) north of the Harris Dam (Figure 2-3).

The industrial portion of the HNP site occupies approximately 178 ha (440 ac) and consists of generating facilities, warehouses, parking lots, equipment storage, and laydown areas. An additional 300 ha (700 ac) of the site have been leased to Wake County for a Fire/Rescue Training Facility (8 ha [20 ac]) and for Harris Lake County Park (280 ha [680 ac]). Most of the remaining portion of the HNP site (between 2000 and 2500 ha (5000 and 6000 ac]) is forested and managed for timber production (Progress Energy 2006b).

2.2.2 Water Use

HNP uses a closed-cycle cooling system with cooling tower makeup (CTMU) water, emergency service water, plant service water, and potable water all supplied from the Harris Reservoir or the auxiliary reservoir. The main Harris Reservoir has a full pool elevation of 67 m (220 ft) above mean sea level (MSL) and covers an area of 1680 ha (4150 ac). The auxiliary reservoir, which serves as the HNP ultimate heat sink, has a surface area of approximately 130 ha (321 ac) and an average surface elevation of 77 m (252 ft) above MSL (Progress Energy 2006b).

2.2.2.1 Surface Water Use

During normal operation of HNP, an average 54.5 million L/day (14.4 million gal/day [MGD]) of water are lost through evaporation and an additional 15 million L/day (4 MGD) are lost to blowdown (Progress Energy 2006b). CTMU water is withdrawn from Harris Reservoir, which is equipped with an intake structure and two CTMU pumps, each rated at 26,000 gpm. In addition, the auxiliary reservoir has two emergency service water pumps, each rated at 20,000 gpm. Operations of the HNP water systems are described in Section 2.1.3.

The CTMU pumps are also used to transfer water from the main reservoir to the auxiliary reservoir to maintain the volume of water needed for the emergency service water system, particularly during drought conditions. The emergency service water system allows water from either reservoir to be pumped to the reactor and other critical components during a loss-of-coolant accident or loss of off-site power.

Water from the auxiliary reservoir is treated onsite and used as potable water throughout the plant. Some of the water is also piped to the HNP demineralized water system where it is treated and demineralized for use in a variety of plant components and systems. HNP does not utilize water from outside sources and has no plans to do so in the future (Progress Energy 2006b).

2.2.2.2 Groundwater Use

HNP is located in the Piedmont physiographic province and is underlain by Triassic age sedimentary rocks of the Newark Group. The uppermost aquifer depth ranges from 9 to 27 m (30 to 90 ft) below the surface and lies within the bedrock material. The residual soils derived from the underlying bedrock are dominated by clay and impede groundwater recharge to the bedrock aquifer. Due to the low permeability of the bedrock material, groundwater flow beneath the plant and surrounding area primarily occurs in fractures located within the bedrock. This results in limited use of groundwater in the area. Average yields from area wells are reported to be less than 19 L/min (5 gpm), but yields may range up to 80 L/min (20 gpm). All public water supplies within the region obtain water from surface water sources (Progress Energy 2006b).

2.2.3 Water Quality

2.2.3.1 Surface Water

Surface water quality is regulated through the EPA NPDES permit program. Section 402 of the Clean Water Act specifies that “NPDES prohibits [discharges] of pollutants from any point source into the nation’s waters except as allowed under an NPDES permit.” Its purpose is to regulate the discharge of wastewater to maintain water quality of receiving water bodies. The EPA delegated its authority to NCDENR for administration of the NPDES program in North Carolina.

The NCDNER issued the renewed HNP NPDES Permit No. NC0039586 with an effective date of March 1, 2007 (Progress Energy 2007c). There are seven major wastewater discharge points (outfalls) at HNP. Outfalls 001 through 005 are each individually monitored and are combined at Outfall 006 in a 91 cm (36 in) diameter pipe which discharges to the southern part of Harris Reservoir at a depth of 12 m (40 ft). Outfall 006 is sampled on the edge of the HNP power block area prior to the combined waste water moving down-gradient to the reservoir. Outfall 007 discharges wastewater from the Harris Energy and Environmental Center sewage treatment plant located on the north end of Harris Reservoir. The wastewater outfalls are further described in Table 2-1.

Table 2-1. HNP Wastewater Discharge Outfalls

Outfall Number	Description	Flow Rate
001	Cooling Tower Blowdown	4–6 MGD
002	Sewage Treatment Facility	0.025 MGD
003	Metal Cleaning Wastes	intermittent
004	Low-Volume Wastes	0.2 MGD
005	Radwaste Treatment System	10 gpm
006	Combined Outfall	4–6 MGD
007	Harris Energy and Environmental Center Wastewater	0.017 MGD

Source: Progress Energy 2007c

Within the past 5 years, there have been three exceedances within HNP's water monitoring program.

- 2/18/2004: Sewage overflow in Outfall 007
- 2/23/2004: Elevated chlorine levels in Outfall 001 due to a stuck pump controller
- 6/25/2004: Elevated zinc concentrations in Outfall 006 (combined outfall)

The NCDENR was notified of each occurrence and the exceedance was immediately corrected. There have been no Notices of Violation (NOVs) at HNP with regard to water monitoring programs in the past 5 years.

In April 2006 HNP received a wastewater pump and haul permit to remove 8500 gpd from the waste water treatment plant and have it treated at the Harris Energy and Electrical Center sewage treatment plant. The removal was necessary because of the increased number of workers on-site during a planned outage. The volume of wastewater removed averaged

11,000 L/day (3000 gpd). The work was completed in May 2006, and the permit was terminated.

The 11 HNP storm water outfalls receive precipitation and runoff from the plant area with discharge going to either the Harris Reservoir or the auxiliary reservoir. Based on average rainfall of 109 cm (43 in.) per year, the discharge through the storm drains is estimated at 33.3 million liters (8.8 million gallons) per month (Progress Energy 2006b). Water from hydrostatic flushing of system piping, equipment and plant wash water, demineralized water, potable water, and service water are also discharged from the storm water outfalls. Two of the storm water outfalls (SW-003 and SW-006) are sampled as representative of conditions for the NPDES permit. No NOVs have been reported for the storm water outfalls.

Table 2-2. Storm Water Discharge Outfalls

Outfall	Impervious Surface Area (acres)	Total Area Drained (acres)
SW-A	0.27	5.07
SW-B	1.00	27.94
SW-001	8.74	66.05
SW-002	2.06	14.08
SW-003	6.58	14.74
SW-004	1.54	33.27
SW-005	9.77	11.53
SW-006	7.45	25.84
SW-007	1.81	45.15
SW-008	0.48	9.55
SW-009	1.24	8.72

Source: Progress Energy 2007c

2.2.3.2 Groundwater

During construction of HNP, three landfills were permitted onsite, but only one was used for waste disposal. Each of the landfills has been closed with the last being the Industrial Landfill, whose closure was effective on May 25, 2005, NC Permit #92-10. Seven monitoring wells were installed in the vicinity of the industrial landfill in December 1986; two of these were later abandoned because they were dry. Initial sampling showed no groundwater contamination. The remaining five wells are sampled semiannually for metals and volatile organic compounds for a 5-year period ending May 2010. The results are reported to the NCDENR, and no evidence of potential contaminants from the landfill has been reported (Progress Energy 2007b).

HNP also has an Underground Storage Tank (UST) Operating permit for 5 on-site USTs. As shown in Table 2-3, contents of the tanks are exclusively petroleum products (Progress Energy 2007e).

Table 2-3. HNP Permitted Underground Storage Tanks

Tank Number	Capacity (gallons)	Contents	Date Installed
001	10,000	Diesel/mixture	01/05/1993
002	10,000	Gasoline/mixture	01/05/1993
003	1,000	Kerosene/mixture	06/12/1999
14	175,000	Diesel/mixture	08/05/1984
15	175,000	Diesel/mixture	08/05/1984

Source: Progress Energy 2007e

2.2.4 Air Quality

HNP is located in the gently rolling central Piedmont region of the state, which rises above the Coastal Plain and lies below the mountains to the west. The climate is warm during summer when average temperatures tend to be in the 21ºC (70ºF) range, and cold during winter when average temperatures tend to be in the 4.4ºC (40ºF) range. The warmest month of the year is July with an average maximum temperature of 31.6ºC (88.9ºF), while the coldest month of the year is January with an average minimum temperature of –0.33ºC (31.4ºF). Temperature variations between night and day tend to be lower during summer with a difference that can reach 10.5ºC (19ºF), and higher during winter with an average difference of 11.6ºC (21ºF). There are no distinct wet and dry seasons in the area of HNP; average rainfall varies around the year. The annual average precipitation is about 111 cm (43.9 in.). The wettest average months of the year are July, August, and September with rainfall of about 14.0 cm (5.5 in.) per month. The driest average months of the year are October, November, and December with rainfall of about 7.4 cm (2.9 in.) per month. Representative weather data was found at the nearby Raleigh-Durham Airport weather station (SCONC 2007).

The prevailing winds are generally from the southwest for 10 months of the year, and from the northeast during September and October. The average annual wind speed is about 3.3 meter per second (7.4 miles per hour), with a maximum annual wind speed of 4.1 meters per second (9.2 miles per hour). The highest wind gusts are in the range of 113 kilometers per hour (70 miles per hour). Areas suitable for wind turbine applications have a wind power class rating of 3 or higher. The wind power class for the HNP site is a relatively low Class 1 (Ramsdell 2007a; Elliott et al. 1987).

Tropical hurricanes or cyclones impact the coast of the state approximately one to two times per year, most often in the late summer and early fall. Ocean temperatures are warmest during this time of the year in the North Atlantic Basin. Since HNP is located well inland, the main impact of hurricanes is increased precipitation. Economic losses can also result from hail and wind from summer thunderstorms. Such storms tend to impact only limited areas. North Carolina is outside the principal tornado area of the United States, but still averages two to three per year. They occur mostly east of the Appalachian Mountains during early spring. The tornado strike probability for HNP is about 6.7×10^{-4} (Ramsdell 2007b).

Nonradioactive air emissions from the HNP site are regulated by the NCDENR, Division of Air Quality. HNP is located in Wake County, North Carolina, which is part of the Eastern Piedmont Intrastate Air Quality Control Region (AQCR). The EPA has established National Ambient Air Quality Standards (NAAQS) for six common pollutants: nitrogen dioxide, sulfur dioxide, carbon monoxide, lead, ozone, and particulate matter with aerodynamic diameters of 10 microns or less (PM_{10}). The EPA has designated all areas of the United States as having air quality better ("attainment") or worse ("nonattainment") than the NAAQS.

All counties in the Raleigh–Durham–Chapel Hill Metropolitan Statistical Area, including Wake County, are in nonattainment with respect to the new 8-hour ozone standard (EPA 2007). Wake County is in attainment for all other air quality standards, except that it continues to be a maintenance area for carbon monoxide (CO) (NCDENR 2007a).

In 1997, the EPA revised the national standard for ground-level ozone from a 0.12 ppm 1-hour "peak" standard to a 0.08 ppm 8-hour "average" standard. This new standard is commonly referred to as the 8-hour ozone standard. In April 2004, EPA published the 8-hour ozone non-attainment designations, and announced that the 1-hour "peak" ozone standard will be phased out.

The closest designated Class I Federal area is located 160 km from the HNP site. Class 1 Federal areas include places such as national parks, national wilderness areas, and national monuments. These areas are granted special air quality protections under the Clean Air Act aimed at protecting visibility. Any modification to a major stationary source occurring within 100 km of a Class 1 Federal area must comply with established requirements. HNP is not a major stationary source.

Diesel engines, diesel compressors, oil-fired boilers, and other sources associated with the HNP site emit various nonradioactive air pollutants to the atmosphere, such as NO_x, SO_2 and CO. Air emissions from these sources are subject to the terms and conditions of a Synthetic Minor air permit issued by the North Carolina Environmental Management Commission Department of Environment and Natural Resources, Division of Air Quality (Air Permit No. 08455R04). This permit is effective from March 21, 2007, until February 29, 2012 (NCDENR 2007b). The permit is based on the Synthetic Minor Air Permit Renewal Application submitted by Progress Energy on December 20, 2006 (Progress Energy 2006c). In general terms, a Synthetic Minor air permit is used for sources that have the potential to emit pollutants in excess of "Major Source" thresholds, but have permit conditions restricting emissions to "Minor Source" levels. The HNP plant must comply with the associated conditions of the permit, including emissions controls, emissions reporting and notifications requirements. Compliance with the air permit conditions has been excellent, with no reported violations related to air emissions (Lane 2007a). Permitted equipment with nonradioactive air emissions at the facility includes:

Compressor 1 – Fuel oil fired emergency compressor (475 horsepower)

Compressor 2 – Fuel oil fired emergency compressor (475 horsepower)

Compressor 3 – Fuel oil fired emergency compressor (475 horsepower)

Compressor 4 – Fuel oil fired emergency compressor (475 horsepower)

Generator A – Fuel oil-fired emergency generator (9074 horsepower)

Generator B – Fuel oil-fired emergency generator (9074 horsepower)

Generator C – Fuel oil-fired emergency generator (650 kilowatt)

Boiler B – Fuel oil-fired boiler (87.4 million Btu per hour)

Temporary Boiler – Fuel oil-fired boiler (86 million Btu per hour)

Temporary Firewater Pump – Fuel oil-fired firewater pump (600 horsepower)

Temporary Generator – Fuel oil-fired emergency generator (1300 kilowatt)

Some of the permitted sources are procured on a rental contract basis, and are not always physically on site, specifically, the compressors, temporary boiler, and temporary generator.

In calendar year 2005, the total annual NO_X emission was 11.03 metric tons (12.16 tons) and the total annual CO emission was 2.88 metric tons (3.17 tons), while all other emission constituents were less than one metric ton (ton) (Lane 2007b). There are no significant changes proposed for nonradioactive air emissions from HNP, and there are no significant changes proposed to the limits and conditions of the Air Permit.

2.2.5 Aquatic Resources

HNP is located on a peninsula stretching from the northwest into the Harris Reservoir, with the Tom Jack Creek arm of the reservoir located on the western side and the Thomas Creek arm located on the eastern side. In late 1980, CP&L created the reservoir by impounding Buckhorn Creek, a tributary of the Cape Fear River, within the Cape Fear River Basin. Eight tributaries

(Tom Jack Creek, Thomas Creek, Little White Oak Creek, White Oak Creek, Utley Creek, Cary Branch, Jim Branch, and Buckhorn Creek) feed into the Harris Reservoir. The reservoir supplies makeup water for HNP's cooling tower. CP&L created an auxiliary reservoir, by impounding a 130 ha (321 ac) portion of the Tom Jack Creek arm of the Harris Reservoir (Figure 2-3) to serve as the ultimate heat sink for the plant.

All seven transmission lines associated with HNP cross streams. The 50-km (31-mi) long Siler City transmission line crosses about 20 streams, including Deep River and the Cape Fear River. The 12-km (7.4-mi) long Cape Fear North transmission line crosses about 6 streams. The 10-km (6.5-mi) long Cape Fear South transmission line has only 1 stream crossing. The 58-km (36-mi) long Fort Bragg–Woodruff Street transmission line crosses about 25 streams, including the Cape Fear River. These four transmission lines also cross the Tom Jack Creek arm of the reservoir and a finger of the Thomas Creek arm. The 6-km (4-mi) long Apex–U.S. 1 transmission line crosses about 8 streams and also crosses the Thomas Creek arm of the reservoir. The 48-km (30-mi) long Erwin transmission line crosses about 25 streams. It also crosses the White Oak Creek arm, the Little White Oak Creek arm, and the Thomas Creek arm of the reservoir. The 61-km (38-mi) long Wake transmission line crosses about 24 streams, including Little Oak Creek. It also crosses the Thomas Creek arm of the reservoir.

2.2.5.1 Water Body Characteristics

Reservoir level is controlled by a spillway in the Harris Dam, keeping the elevation at or below 67 m (220 ft). The dam regulates the streamflow of Buckhorn Creek, which continues downstream of the dam until it joins the Cape Fear River. From 1981 to 2003, the annual mean streamflow of Buckhorn Creek, measured 1.6 km (1 mi) downstream of the dam, ranged from 0.07 to 9 m^3/sec (2.47 to 137 cubic feet per second [cfs]). The spillway is not controlled by CP&L, but water spills over naturally due to rainfall for an estimated 6 months out of the year, with an annual average rate of 0.3 m^3/sec (10 cfs) (4500 gpm or less than 2.5 million gallons per year). The surface area of the reservoir is 1680 ha (4151 ac), with a maximum depth of 17 m (56 ft), a mean depth of 6.1 m (20 ft), a volume of 82,000 ac-ft (2.7×10^{10} gal), and an average residence time of 28 months (NCDENR 2004). Under normal operations, only one of the two makeup pumps takes up water, at a rate of 26,000 gpm. In addition to the receiving discharge from HNP, the reservoir receives discharges from the Harris Energy and Environmental Center and a wastewater treatment plant in Holly Springs via Utley Creek (a tributary of White Oak Creek).

The shoreline and immediate watershed are wooded, and the drainage area consists of rolling hills used for silviculture and agriculture. The bottom of Harris Reservoir is mostly clay, with organic materials and some sand.

Harris Reservoir waters tend to be stratified in summer months and mixed in winter months (Progress Energy 2001, 2003b). From data collected in 1992 and 2000, water temperatures near the surface of the reservoir range from 7°C (50°F) in the winter to 32°C (90°F) in the summer (CP&L 1994; Progress Energy 2001). Based on calculated North Carolina Trophic State Index, Harris Reservoir is classified as eutrophic (NCDENR 2004). Although concentrations of phosphorous and nitrogen rose rapidly in the late 1980s and early 1990s, monitoring by CP&L in recent years has shown that nutrient levels are now stable, and are typical of a productive, southeastern reservoir. Subsurface waters are seasonally oxygen-deficient. Other water quality parameters, such as total dissolved solids, turbidity, total organic carbon, ions, total alkalinity, hardness, and copper, exhibit no significant spatial trends, and none are at harmful levels for the local aquatic environment (Progress Energy 2003b). Mean *chlorophyll a* concentrations, which are indicators of algal blooms, reflect moderate to high productivity. In 1997 and 1998, concentrations of *chlorophyll a* exceeded the 40 microgram per liter (µg/L) North Carolina water quality standard, but as of 2002, this has not recurred (Progress Energy 2001, 2003b).

The dominant species of aquatic plants are hydrilla (*Hydrilla verticillata*) and creeping water primrose (*Ludwigia grandiflora*), both invasive species. In 1994, 1996, and 1997, CP&L stocked the auxiliary reservoir with grass carp (*Ctenopharyngodon idella*) to control for hydrilla, and according to the *2002 Environmental Monitoring Report* (Progress Energy 2003b), no hydrilla has been observed in the auxiliary reservoir. While these invasive species of aquatic vegetation can be a nuisance for power plants, anglers perceive the plants as desirable fish habitat (Jones et al. 2000; Kibler 2007). In 2002, water hyacinth (*Eichhornia crassipes*) and water lettuce (*Pistia stratiotes*) were both observed in the Harris Reservoir. CP&L removed both species, and neither invasive plant has been observed since then (Progress Energy 2003b).

On the shorelines of both the main and auxiliary reservoir, vegetation includes common cattail (*Typha latifolia*), common rush (*Juncus effusus*) and woolgrass (*Scirpus cyperinus*). Water shield (*Brasenia schreberi*) and fragrant water lily (*Nymphaea odorata*) grow throughout the reservoir's littoral zone. Brittle naiad (*Najas minor*) has been found in the auxiliary reservoir. In the White Oak Creek arm of Harris Reservoir, American lotus (*Nelumbo lutea*) grows (CP&L 1994).

Asiatic clam (*Corbicula fluminea*), an invasive freshwater mollusk, has been present in Harris Reservoir for over a decade and continues to spread, based on qualitative observations made by CP&L (CP&L 1994). As of 2002, the zebra mussel (*Dreissena polymorpha*), another invasive freshwater mollusk, has not been found in Harris Reservoir (Progress Energy 2003b).

Harris Reservoir is dominated by bluegill (*Lepomis macrochirus*), redear sunfish (*L. microlophus*), and largemouth bass (*Micropterus salmoides*). Together with black crappie (*Pomoxis nigromaculatus*), these four members of the centrarchid family accounted for 80 percent of the mean number of fish per hour collected in Harris Reservoir in 2002 by electrofishing sampling (Progress Energy 2003b), when the mean number of total fish per hour collected was 322, which exceeded the reservoir averages from the previous 12 years. By weight, the dominant species are bluegill, redear sunfish, largemouth bass, and gizzard shad (*Dorosoma cepedianum*) (Progress Energy 2001, 2003b).

Other common fish species in the Harris Reservoir include bluespotted sunfish (*Enneacanthus gloriosus*), bowfin (*Amia calva*), brown bullhead (*Ameiurus nebulosus*), chain pickerel (*Esox niger*), channel catfish (*Ictalurus punctatus*), coastal shiner (*Notropis petersoni*), flat bullhead (*Ameiurus platycephalus*), golden shiner (*Notemigonus crysoleucas*), pumpkinseed (*Lepomis gibbosus*), redbreast sunfish (*L. auritus*), threadfin shad (*D. petenense*), warmouth (*L. gulosus*), white catfish (*Ameiurus catus*), white crappie (*Pomoxis annularis*), and white perch (*Morone americana*) (Progress Energy 2003b).

Several species were introduced to the reservoir. The non-native grass carp is an herbivore that was introduced to the auxiliary reservoir to control the spread of nuisance vegetation. Common carp (*Cyprinus carpio*), native to Asia, was collected for the first time in 2000 in the reservoir, although it had been previously known to exist in the Cape Fear River before the impoundment of the reservoir (Progress Energy 2003b). Threadfin shad were stocked in the Harris Reservoir once in 1987 by the North Carolina Wildlife Resources Commission to provide prey for largemouth bass (Progress Energy 2006b). Channel catfish were stocked in the reservoir in 1985, but as of 1997, a reproducing channel catfish population has not been established (Jones et al. 2000).

Harris Reservoir has become popular in recent years for largemouth bass fishing. Based on a creel survey conducted July 1997 through June 1998 (Jones et al. 2000), the estimated fishing effort during that time was 188,948 hours, or 118 hours/hectare (48 hours/ac). Sixty-seven percent of the effort was directed at largemouth bass, with crappie fishing only 17 percent of effort (Jones et al. 2000). In response to the fishing pressure on Harris bass, in 2002 the North Carolina Wildlife Resources Commission imposed a daily limit for largemouth bass of five in aggregate, of which only two may be less than 14 in. and none may be between 16 and 20 in. (NCWRC 2007).

American beavers (*Castor canadensis*) build lodges on Harris Reservoir, but their presence has not created a problem for the operation for the plant.

2.2.5.2 Threatened or Endangered Aquatic Species

Aquatic species that are listed as threatened or endangered by the U.S. Fish and Wildlife Service (FWS) or the State of North Carolina and have the potential to occur in Wake or Chatham counties or in counties crossed by HNP-associated transmission lines are presented in Table 2-4.

Within Wake and Chatham counties and the counties (Cumberland, Harnett, Lee, and Randolph) crossed by HNP-associated transmission lines, two aquatic species are Federally listed as endangered: the Cape Fear shiner (*Notropis mekistocholas*) and the dwarf wedgemussel (*Alasmidonta heterodon*) (NCNHP 2007).

The Cape Fear shiner is a small minnow, approximately 5 cm (2 in.) long. Associated with gravel, cobble, and boulder substrates, the Cape Fear shiner is endemic to the upper Cape

Fear River Basin in the Central Piedmont of North Carolina and has been found in the tributaries and mainstreams of the Deep, Haw, and Rocky rivers. Of the five populations remaining, two are very small and unstable. The other three populations are estimated to have a total effective population size (defined by the number of available breeding individuals) between 1500 and 3000 individuals. Three critical habitats were designated under the Endangered Species Act of 1973, as amended (ESA): in Chatham County, 6.6 km (4.1 mi) of the Rocky River; in Chatham and Lee counties, 0.8 km (0.5 mi) of Bear Creek, 6.8 km (4.2 mi) of Rocky River, and 4 km (2.6 mi) of Deep River; and in Randolph and Moore Counties, 2.4 km (1.5 mi) of Fork Creek and 6.6 km (4.1 mi) of Deep River (FWS 2007c). In 1972 CP&L reported the species as rare in Buckhorn Creek and not present in the other creeks (AEC 1974). One specimen was collected in the Cape Fear River, downstream of the reservoir during pre-operational surveys in 1972 through 1980 (NRC 1983). In 1998, CP&L conducted a self-assessment of HNP for threatened and endangered species, and reported that the nearest recorded Cape Fear shiner was from Parkers Creek, a tributary of Jordan Lake (CP&L 1998). There are no details for when this specimen was found. The Cape Fear shiner is not currently known to inhabit Buckhorn Creek or Harris Reservoir, and these waters have not been designated as one of the three critical habitat areas.

Found in large rivers and small streams, the dwarf wedgemussel is small, with a shell that rarely exceeds 45 mm (1.8 in.) in length. Individuals often burrow into clay banks near root systems of trees, in mixed substrates of cobble, gravel, and sand, or occasionally in soft silt. Like all freshwater mussels, this species uses fish hosts, including the tessellated darter (*Etheostoma olmstedi*), Johnny darter (*E. nigrum*), and mottled sculpin (*Cottus bairdi*), as part of their maturation process (FWS 2007a). There are no known populations of these fish species in the Harris Reservoir (Progress Energy 2001, 2003b). Known populations of the dwarf wedgemussel in North Carolina are found in certain creeks within the Neuse River and Tar River Basins. The dwarf wedgemussel has not been found in the Cape Fear River Basin (NCWRC 2007b).

The Sandhills chub (*Semotilus lumbee*), a Federal and State species of special concern, is known to occur in a stream that crosses the Harris-Fayetteville transmission line ROW (Progress Energy 2006b). No other aquatic threatened or endangered species or species of special concern are known to occur at HNP or in its transmission line ROWs.

Table 2-4. Federally and State-Listed Aquatic Species Potentially Occurring in Wake or Chatham Counties or in Counties Crossed by Associated Transmission Line ROWs

Scientific Name	Common Name	Federal Status[a]	State Status[a]
Fish			
Ambloplites cavifrons	Roanoke bass	—	SR
Cyprinella zanema pop 2	Santee chub - Coastal Plain population	—	SC
Etheostoma collis pop 2	Carolina darter - eastern Piedmont population	SC	SC
Lampetra aepyptera	least brook lamprey	—	T
Lythrurus matutinus	Pinewoods shiner	SC	SR
Moxostoma sp 2[b]	Carolina redhorse	SC	SR (PE)
Notropis mekistocholas	Cape Fear shiner	E	E
Noturus furiosus	Carolina madtom	—	SC (PT)
Noturus sp 1[b]	broadtail madtom	—	SC
Semotilus lumbee	Sandhills chub	SC	SC
Mollusks			
Alasmidonta heterodon	dwarf wedgemussel	E	E
Alasmidonta undulata	triangle floater	—	T
Alasmidonta varicosa	brook floater	SC	E
Elliptio folliculata	pod lance	—	SC
Elliptio lanceolata	yellow lance	SC	E
Elliptio marsupiobesa	Cape Fear spike	—	SC
Elliptio roanokensis	Roanoke slabshell	—	T
Fusconaia masoni	Atlantic pigtoe	SC	E
Lampsilis cariosa	yellow lampmussel	SC	E
Lampsilis radiata conspicua	Carolina fatmucket	—	T
Lampsilis radiata radiata	eastern lampmussel	—	T
Lasmigona subviridis	green floater	SC	E
Strophitus undulatus	creeper	—	T
Toxolasma pullus	Savannah lilliput	SC	E
Villosa constricta	notched rainbow	—	SC
Villosa delumbis	eastern creekshell	—	SR

Scientific Name	Common Name	Federal Status[(a)]	State Status[(a)]
Villosa vaughaniana	Carolina creekshell	SC	E
Crustaceans			
Cambarus catagius	Greensboro burrowing crayfish	—	SC
Cambarus davidi	Carolina ladle crayfish	—	SR
Orconectes carolinensis	North Carolina spiny crayfish	—	SC

Sources: NCNHP 2007.

(a) E = Endangered, T = Threatened, — = not listed, SC = Special Concern, SR = Significantly Rare, P = Proposed

(b) sp 1 and sp 2 denote that species are currently undescribed.

2.2.6 Terrestrial Resources

2.2.6.1 Terrestrial Resources at the Shearon Harris Site

The HNP site and associated transmission lines span across Wake, Chatham, and Harnett counties, which are primarily in the Piedmont Province and coastal plain (NCNHP 2003). The overall terrain is gently rolling with some steep areas along the creeks and rivers where banks can rise over 30 m (100 ft) above the stream channel (NCNHP 2003). The HNP site has a total area of approximately 4370 ha (10,800 ac). The reservoir, formed from a dam on Buckhorn Creek, covers approximately 1680 ha (4150 ac) of the total HNP site. Of the remaining acreage, 180 ha (440 ac) is used for industrial purposes, 283 ha (700 ac) is leased to Wake County for a county park and a fire-and-rescue training facility, and 2000 to 2500 ha (5000 to 6000 ac) are forested land (Progress Energy 2006b).

CP&L has enrolled 5700 ha (14,090 ac) of land around the Harris Reservoir in the North Carolina Game Lands Program, known collectively as the Shearon Harris Game Lands. The Game Lands are separate from the HNP site, but still owned and operated by CP&L (Progress Energy 2006b). Transmission line ROWs cross the Game Lands in four locations. The Shearon Harris Game Lands are used for recreation, education, development, associated transmission lines, and hunting (Progress Energy 2006b). The North Carolina Wildlife Resources Commission issues hunting permits for bear, deer, wild boar, wild turkeys, small game, and waterfowl.

Pre-settlement vegetation at the HNP site consisted of forested land with isolated marshes and wetlands; however, as Wake County has become more populated in the past 20 years, forested areas and agricultural lands have developed into commercial and residential areas. This change has occurred primarily within the last decade, as the commercial development has been fueled by the growing concentration of biotechnology, biomedical, and computer and software companies in Wake County. Presently only 17 percent of the land in Wake County is used for agricultural production (NCNHP 2003).

Eighty-five percent of Wake County lies within the Neuse River Basin, and the remaining southwest corner of the county, including the HNP site, lies within the Cape Fear River Basin (NCNHP 2003). The majority of waterways that enter the county flow southeast towards the Atlantic Ocean. No natural lakes occur in the county, but several large reservoirs exist, most notably Harris Reservoir (NCNHP 2003). Other smaller, artificially created lakes and ponds exist throughout the county. The Buckhorn Creek, Tom Jack Creek, Thomas Creek, Little White Oak Creek, White Oak Creek, Utley Creek, Cary Branch, and Jim Branch watersheds are all within the Cape Fear River Basin. Terrestrial vertebrates, including birds (both migratory and non-migratory species), mammals, reptiles, and amphibians, all inhabit the Cape Fear River watershed.

Vegetative plant communities at the HNP site consist of upland forest, lowland forest, and wetlands. The upland forest areas can be subdivided into pine forest, hardwood forest, and pine-hardwood mixtures (Progress Energy 2006b). Most of the upland forest is managed for timber production. The lowland forests on the HNP site are generally closer to water and are composed of a mixture of maples (*Acer* spp.), birches (*Betula* spp.), elms (*Ulmus* spp.), and shrubs. The open marsh areas are primarily composed of grasses and aquatic vegetation and are without woody vegetation.

The upland pine forests at the HNP site primarily consist of loblolly pine (*Pinus taeda*), shortleaf pine (*P. echinata*), Virginia pine (*P. virginiana*), and longleaf pine (*P. palustris*). The upland hardwood forests at the HNP site primarily consist of oaks (*Quercus* spp.), hickories (*Carya* spp.), and some maples. Virginia spiderwort (*Tradescantia virginiana*), which is rare in Wake County, can be found on the sloping areas of the upland hardwood forest (Progress Energy 2006b). Pine-hardwood mixture forests contain species characteristic of both the upland hardwood and upland pine forests.

Plant species found in the lowland forest at the HNP site include sweet gum (*Liquidambar styaciflua*), red maple (*A. rubrum*), American sycamore (*Platanus occidentalis*), American elm (*U. americana*), and river birch (*Betula nigra*) (Progress Energy 2006b). Vegetation characteristic of the wetland areas include cattail (*Typha* spp.), cordgrass (*Spartina* spp.), rushes (*Juncus* spp.), and rice cutgrass (*Leersia oryzoides*). The FWS National Wetlands Inventory database indicates that wetlands, some of which are classified as significant habitats, exist on and in the vicinity of the HNP site along many of the waterways feeding into Harris Reservoir and along the banks of the Harris Reservoir. Several of the transmission line ROWs cross wetland habitats.

CP&L has not found that invasive terrestrial species interfere with plant operation thus far; however, several invasive plant species exist that are potentially within the vicinity of the HNP site. These include garlic mustard (*Alliaria petiolata*), tree-of-heaven (*Ailanthus altissima*), and bull thistle (*Cirsium vulgare*), all of which have the ability to displace native species and reduce species diversity (NCNPS 2006). During a site audit NRC staff conducted in June 2007, the NRC staff observed a population of Japanese beetles (*Popillia japonica*), which is invasive to most areas of the eastern United States. CP&L is not required to keep and does not keep records of known invasive species and does not have any programs or procedures in place to control terrestrial plant or animal invasive populations on the HNP site.

Two of the three significant natural heritage areas (SNHA), which are managed by the North Carolina Natural Heritage Program (NCNHP), are located on the HNP site. The first SNHA is a field located within the Harris Research Tract, which is historically a nesting site for the Federally endangered red-cockaded woodpecker (*Picoides borealis*). The nesting site was confirmed to be abandoned in 1987 (Progress Energy 2006b). The second SNHA is a great blue heron (*Ardea herodias*) rookery, located on the southern end of the Harris Reservoir along Jim Branch. The NCDENR reported that 32 nests were counted on a site visit in 2002, which makes the rookery one of the largest known colonies of great blue herons in the eastern Piedmont region (NCDENR 2006).

The Shearon Harris Longleaf Pine Forest, a remnant of the natural Piedmont longleaf pine savannah community, is the third SNHA and is located northeast of Harris Reservoir within the HNP site (NCDENR 2006; NCNHP 2003). The longleaf pine savannah is characterized by longleaf pines, which form an open canopy, and shrubs and herbs, which create a dense ground cover. North Carolina State University (NC State) manages the Shearon Harris Longleaf Pine Forest as part of the Harris Research Tract, which is discussed below. NC State is managing the Shearon Harris Longleaf Pine Forest in order to facilitate the continued survival of the longleaf pine savannah community, which has become a rare habitat in the State of North Carolina (Progress Energy 2006b).

The Harris Research Tract encompasses a 513 ha (1267 ac) plot of land, which CP&L leases to the NC State Department of Forestry for research purposes (Progress Energy 2006b). NC State uses the land to research forestry management practices, such as prescribed burns and selective cutting, on a long-term basis. NC State also focuses on regional pine species, especially the longleaf pine discussed above, and threatened and endangered plant species (Progress Energy 2006b).

Timber harvesting occurs at the HNP site in the upland forests. Best management practices (BMPs) are implemented by CP&L using the guidance of the NCDENR and the North Carolina Division of Forest Resources. BMPs include guidelines for responsible management of forested areas, riparian zones, buffer strips, and wetlands, as well as overall management of water bodies such as Harris Reservoir (Progress Energy 2006b).

CP&L maintains the following public access areas at the HNP site: an environmental center and associated hiking trails, and a portion of the Harris Research Tract. Additionally, the following limited public access areas are maintained on the HNP site: a fire-and-rescue training facility, hunting areas, boat ramps on the Harris Reservoir, and limited access parks (Progress Energy 2006b).

Wake County and the State of North Carolina maintain and operate several parks and open spaces for recreation in the vicinity of the HNP site. Harris Lake County Park, a 260 ha (640 ac) park located on the Harris Reservoir and adjacent to the HNP site is leased to Wake County by CP&L (Progress Energy 2006b). Harris Lake County Park holds the only longleaf pine habitat outside the Harris Research Tract. Located about 16 km (10 mi) from the HNP site, Jordan Lake State Recreation Area in Apex, North Carolina, is a large summertime habitat for the bald eagle (*Haliaeetus leucocephalus*), and has a public observation deck for bird watching (NCDPR 2006). The Jordon Lake State Recreation Area is leased to the State of North Carolina by the U.S. Federal Government.

CP&L maintains wildlife management plans for the HNP site, which include checklists for qualified biologists to complete in order to ensure that all appropriate procedures and BMPs are followed where applicable to minimize the effects of plant operation on wildlife. A variety of wildlife species are found at the HNP site and in the surrounding area. Forested areas support many species of birds, snakes, frogs, lizards, toads, as well as whitetail deer (*Odocoileus virginianus*), Virginia opossums (*Didelphis virginiana*), northern raccoons (*Procyon lotor*), eastern gray squirrels (*Sciurus carolinensis*), eastern cottontails (*Sylvilagus floridanus*), striped skunks (*Mephitis mephitis*), bobcats (*Lynx rufus*), and American black bears (*Ursus americanus*). Additionally, migratory songbirds and waterfowl commonly pass through the HNP site, which is part of the Atlantic flyway. Harris Reservoir supports species such as the great blue heron, great white egret (*Ardea alba*), osprey (*Pandion haliaetus*), and double-crested cormorant (*Phalacrocorax auritus*), as well as numerous goose and duck species. Wood duck (*Aix sponsa*) boxes are maintained throughout the Harris Reservoir to promote nesting of this species.

2.2.6.2 Threatened and Endangered Terrestrial Species

Two Federally listed threatened or endangered terrestrial species: the red-cockaded woodpecker (*Picoides borealis*), and Michaux's sumac (*Rhus michauxii*), as well as the formerly listed bald eagle (*Haliaeetus leucocephalus*) have been found in the vicinity of HNP. Three State-listed threatened or endangered species have been confirmed in the vicinity of HNP: the Carolina grass-of-Parnassus (*Parnassia caroliniana*), the eastern tiger salamander (*Ambystoma tigrinum*), and the four-toed salamander (*Hemidactylium scutatum*) (Progress Energy 2006b). Protected and rare terrestrial species known to occur in Wake or Chatham counties or in counties crossed by HNP-associated transmission lines ROWs can be found in Table 2-5.

Federally Protected Species

On July 9, 2007, the FWS issued a *Federal Register* notice announcing the removal of the bald eagle species from the Federal List of Endangered and Threatened Wildlife (72FR37346). Bald eagles, formerly listed as threatened, are sighted occasionally at the Harris Reservoir (Progress Energy 2006b). The bald eagle is a large bird, even among raptor species, and can reach a weight of more than 6 kg (13 lb). Bald eagle adults have a white head and tail and brown body feathers, while juveniles are entirely brown and remain so until 5 to 6 years of age. Bald eagle habitat consists of forested areas throughout North America. The species feeds primarily on fish, as well as other small animals and occasionally carrion (NCWRC 2005). In the 2004–2005 nesting season, one active bald eagle nest was discovered near the Harris Reservoir (Progress Energy 2006b).

Potential habitat for the endangered red-cockaded woodpecker, a small and slender woodpecker species, is located within the HNP site (FWS 2007d). The red-cockaded woodpecker prefers to nest in mature pine forests, especially areas containing longleaf pines and loblolly pines, which are abundant on the HNP site (U.S. Audubon Society 2002; Progress Energy 2006b). The bird's diet is composed mainly of insects, which include ants, beetles, wood-boring insects, caterpillars, and worms. The red-cockaded woodpecker may also supplement 15 to 20 percent of its overall diet with seasonal wild fruit. Egg laying occurs between April and June (FWS 2007d). The bird's range is closely tied to the distribution of southern pines. The species is known to currently inhabit 11 states, of which the most abundant populations occur in North Carolina and South Carolina (U.S. Audubon Society 2002; FWS 2007d). A red-cockaded woodpecker nest with known activity was located in the proximity of the HNP site during the 1980s; however, the nest was confirmed to be abandoned in 1987. No activity has since been observed, and the pair is believed to have vacated the site (Progress Energy 2006b).

Michaux's sumac, listed as endangered, is found within the land set aside for research at NC State. The entire population of Michaux's sumac occurring on the HNP site is designed for research as an experimental population, which was originally transplanted in 2001 by NC State (Progress Energy 2006b). Michaux's sumac, a plant in the cashew family, is a rhizomatous, densely hairy shrub, with erect stems 0.3 to 0.9 m (1 to 3 ft) in height. The compound leaves contain evenly serrated, oblong to lanceolate, acuminate leaflets. The flowers are small, borne in a terminal, erect, dense cluster, and colored greenish yellow to white with flowering usually occurring from June to July. The fruit, a red drupe, is produced through the months of August to October. The species inhabits sunny areas, and is generally not considered shade-tolerant (FWS 2007b). Michaux's sumac occurs in the southeastern United States, with habitat spanning from North Carolina southward to Georgia.

State-Protected Species

The endangered Carolina grass-of-Parnassus occurs in wet savannahs in the Harris–Fayetteville transmission line ROW (Progress Energy 2006b). The species inhabits the Coastal Plain and Sandhills of the southeastern U.S. and grows in fire-maintained, wet savannahs as well as ecotonal areas between pine uplands and seepage slopes or streamhead pocosins. The Carolina grass-of-Parnassus has basal leaves that are rounded with long leafstalks as well as a single, stalkless rounded leaf on the flower stalk. Timber production and changes in hydrology have diminished the range of the plant and continue to pose a significant threat to its habitat (CPC 2007).

The threatened eastern tiger salamander occurs near the Harris–Wake transmission line ROW (Progress Energy 2006b). The salamander has an average length of 18 to 20 cm (7 to 8 in.), a stocky body, strong limbs, and a long tail. The salamander is dark brown, with yellow and olive irregular blotches marking the body. The eastern tiger salamander lives most of its life underground, requiring contaminent-free soils as its habitat. The species' range is along the east coast from Florida to New York, but also occurs in parts of the Midwest (NYDEC 2007). The salamander feeds on insects, worms, minnows, and occasionally other small amphibians (CRACM 2007a).

The four-toed salamander (*Hemidactylium scutatum*), a State-listed species of special concern, has recorded breeding areas in vernal pools outside of the property boundaries of CP&L (Progress Energy 2006b). Four-toed salamanders are easily identified by three distinctive characteristics: four toes on the hind feet, a distinct basal constriction on the tail, and a bright white underbelly with black speckles. Four-toed salamanders most commonly inhabit wet moss. The species subsists primarily on ticks, beetles, ants, snails, midges, and fly larvae (CRACM 2007b).

Table 2-5. Federally and State-Listed Terrestrial Species Potentially Occurring in Wake or Chatham Counties or in Counties Crossed by Associated Transmission Line ROWs

Scientific Name	Common Name	Federal Status[a]	State Status[a]	Habitat
Reptiles and Amphibians				
Alligator mississippiensis	American alligator	T	T	Swampy areas, rivers, lakes, streams, and ponds
Ambystoma tigrinum	eastern tiger salamander	—	T	Sandy, gravelly, or barren forested areas with pools for breeding
Crotalus adamanteus	eastern diamondback rattlesnake	—	E	Pine flatwoods, abandoned farmland, or sandy woodlands
Crotalus horridus	timber rattlesnake	—	SC	Deciduous forests with rugged terrain
Heterodon simus	southern hognose snake	—	SC	Upland forests with sandy soils
Hemidactylium scatatum	four-toed salamander	—	SC	Swamps; boggy streams; near ponds or mossy pools
Necturus lewisi	Neuse River waterdog	—	SC	Wide, fast-flowing streams with high oxygen and hard substrate
Pituophis melanoleucus	northern pine snake	—	SC	Sandhills and pine flatwoods

Scientific Name	Common Name	Federal Status[(a)]	State Status[(a)]	Habitat
Rana heckscheri	river frog	—	SC	Forest streams
Sistrurus miliarius	pigmy rattlesnake	—	SC	Sandhills with oak and pine flatwoods
Micrurus fulvius	eastern coral snake	—	E	Well drained pine woods near ponds or streams
Birds				
Aimophila aestivalis	Bachman's sparrow	—	SC	Scattered, shrubby vegetation with dense herbaceous understudy
Egretta caerulea	little blue heron	—	SC	Freshwater ponds, lakes, rivers, streams, swamps, marshes and lagoons
Haliaeetus leucocephalus	bald eagle	—	—	Large open bodies of water with adjacent riparian areas
Lanius ludovicianus	loggerhead shrike	—	SC	Forest habitat with preference for tree species with thorns
Picoides borealis	red-cockaded woodpecker	E	E	Mature pine forests with preference of loblolly and longleaf pines
Mammals				
Condylura crisata	star-nosed mole	—	SC	Forests, clearings, marshes, wet meadows, and peat bogs with nearby stream banks and moist soils
Myotis austroriparius	southeastern myotis	—	SC	Forest habitats with caves or tree hollows and nearby waterways
Plants				
Amorpha georgiana georgiana	Georgia indigo-bush	—	E	Brushy and weedy habitats along the edges of farmland, forests, roads, and transmission line ROWs
Astragalus michauxii	Sandhills milkvetch	—	T	Herb-dominated sandhills
Carex barrattii	Barratt's sedge	—	E	Wetlands and occasional stream banks
Carex exilis	coastal sedge	—	T	Marshes and other wetlands
Chrysoma pauciflosculosa	woody goldenrod	—	E	Dunes, salt flats, and sandy woodlands
Eupatorium resinosum	pine barren boneset	—	T, SC	Sandhills and coastal plains
Helenium brevifolium	littleleaf sneezeweed	—	E	Sandhills and coastal plains
Helianthus schweinitzii	Schweinitz's sunflower	E	E	Roadsides, pastures, ROWs, forest clearings, and other open sunny areas

Scientific Name	Common Name	Federal Status[(a)]	State Status[(a)]	Habitat
Isoetes piedmontana	Piedmont quillwort	—	T	Rough, hilly terrain and rolling hills
Lilium pyrophilum	Sandhills lily	—	E, SC	Sandy ridges in pine forest understories and clearings
Lindera melissifolia	pondberry	E	E	Poorly drained, swampy depressions and sand dunes
Lindera subcoriacea	bog spicebush	—	T	Forest understories and forest clearings
Lobelia boykinii	Boykin's lobelia	—	T	Swamps and cypress ponds
Lysimachia asperulaefolia	rough-leaved loosestrife	E	E	Ecotones between pine uplands
Macbridea caroliniana	Carolina bogmint	—	T	Forested flatlands with poor drainage
Muhlenbergia torreyana	pinebarren smokegrass	—	E	Ecotones between pine uplands
Myriophyllum laxum	loose watermilfoil	—	T	Streams, rivers, pond, bogs, and swamps
Parnassia caroliniana	Carolina grass-of-Parnassus	—	E	Bogs, swamps, moist woods, and other wet areas
Portulaca smallii	Small's portulaca	—	T	Forest edges
Pteroglossaspsis ecristata	spiked medusa	—	E	Open areas with sandy soil
Ptilimnium nodosum	harperella	E	E	Rocky or gravelly shoals of stream bottoms or pond edges
Pyxidanthera brevifolia	Sandhills pixie-moss	—	E	Pine forests and sandhills
Rhexia aristosa	awned meadow-beauty	—	T	Wet, sandy soils with fluctuating water levels and occasional inundation
Rhus michauxii	Michaux's sumac	E	E, SC	Sandy or rocky open woods
Rhynchospora macra	southern white beaksedge	—	E	Marshes, swamps, and bogs
Rudbeckia heliopsidis	sun-facing coneflower	—	E	Grasslands around forest edges
Ruellia humilis	low wild petunia	—	T	Grasslands around forest edges
Schwalbea americana	American chaffseed	E	E	Sandy soils in flatwoods, savannahs, forest edges, and other open areas
Solidago verna	spring flowering goldenrod	—	T	Wetlands and stream banks
Stylisma pickeringii	Pickering's dawnflower	—	E	Dry, barren, sandy areas

Scientific Name	Common Name	Federal Status[a]	State Status[a]	Habitat
Symphyotrichum georgianum	Georgia aster	C	T	Dry, high light areas, in savannah or prairies
Trillium pusillum	Carolina least trillium	—	E	Forested, freshwater, and riparian areas
Utricularia olivacea	dwarf bladderwort	—	T	Forested wetlands with poorly drained soils

Sources: NCNHP 2007; Progress Energy 2006b

(a) C = Candidate, E = Endangered, SC = Special Concern, T = Threatened, — = No listing

2.2.7 Radiological Conditions

HNP does not discharge unprocessed radioactive liquid wastes directly into a river, lake, or ocean; all radioactive liquid wastes are processed by the LWPS. Sludges and evaporator bottoms that are associated with liquid wastes are dewatered, solidified, and then shipped to an offsite disposal facility. Radioactive gaseous effluents are controlled by holdup in a series of storage tanks until very significant radioactive decay has occurred before the gases are released into the environment. HNP publishes an Annual Radioactive Effluent Release Report which provides detailed information on the types and quantities of radioactive material released into the environment. Through the sampling and analysis of various types of environmental media the REMP assesses the radiological impact to employees, the public, and the environment. The results of the environmental monitoring are documented and compared to the appropriate regulatory standards. HNP publishes the results of its environmental monitoring program in an Annual Radiological Environmental Operating Report (Progress Energy 2003a, 2004a, 2005a, 2006d, 2007a). The objectives of the REMP are as follows:

- Provide representative measurements of radiation levels and concentrations of radioactive materials in pertinent exposure pathways for the radionuclides that have the highest potential for radiation exposures to members of the public; and

- Supplement the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of effluent measurements and modeling of the environmental exposure pathways.

The ODCM contains the methodology for calculating the radiation dose that may be received by the maximally exposed member of the public from all radiation exposure pathways associated with HNP. The limits for all radiological releases are specified in the HNP ODCM, also. These release limits are used to help ensure compliance with regulatory requirements. The REMP includes monitoring of the waterborne environment (ground, water, and shoreline sediment); airborne environment (airborne radioiodine, gross beta, and gamma); ingestion pathways (milk, fish and invertebrates, and food products); and direct radiation. The REMP reports that were reviewed found no indication of significant radiological effects of HNP on the environment.

In addition to the REMP, in response to NRC and industry initiatives HNP established a groundwater protection program in 2006. The program contains requirements for monitoring of four onsite groundwater monitoring wells. In addition to the onsite wells, HNP also performs periodic surveillance and monitoring of selected plant buildings, systems, and components containing liquids with radioactive material, for indication of leaks. The program includes criteria to notify the Control Room and Environmental and Chemistry personnel for follow-up assessment and cleanup, as necessary (Progress Energy 2006). At the time of the audit, there were no indications of radioactive leaks into the groundwater. During the periodic NRC inspection of the REMP, the groundwater protection program will be reviewed for information on indications of leaks into the groundwater and the actions taken by the applicant.

A historical review of radioactive release data from HNP, together with the resultant dose calculations, demonstrated that the calculated doses to maximally exposed individuals in the vicinity of HNP were a small fraction of the limiting values specified in the HNP ODCM to meet 10 CFR Part 50, Appendix I dose design objectives, the 10 CFR Part 20 dose limits, and the EPA radiation standards in 40 CFR Part 190. For 2006, dose estimates were calculated based on actual liquid and gaseous effluent release data and conservative models for simulation of the transport mechanisms. The results are presented in the *Shearon Harris Nuclear Power Plant, Annual Radioactive Effluent Release Report for 2006*. The calculated maximum dose to an individual located at the HNP boundary from liquid effluents that were released is summarized as follows:

- The maximum whole-body dose to an offsite member of the general public from liquid effluents was expected to be no more than 8.20×10^{-3} mSv/y (0.820 mrem/y) well below the 0.03 mSv/y (3 mrem/y) dose design objective in 10 CFR Part 50, Appendix I.

- The maximum whole-body dose to an offsite member of the general public averaged over the last 5 years and based on actual monitoring data from the REMP was 8.34×10^{-5} mSv/y (8.34×10^{-3} mrem/y), well below the 0.03 mSv/y (3 mrem/y) dose design objective in 10 CFR Part 50, Appendix I.

Each reported annual dose from gaseous effluents is calculated based on the highest 12-year annual average relative concentration and deposition factor for particulates at the most restrictive location at the site boundary. Therefore, the doses reported for 2006 were based on meteorological data for 1976 through 1987.

During the last five years, releases of tritium, iodine-131, iodine-133, and particulates with greater than an 8-day half life resulted in a calculated average annual dose of 2.28×10^{-3} mSv/y (0.228 mrem/y) with the lungs being the critical organ of the maximally exposed member of the general public. This calculated average annual dose is well below the 0.15 mSv/y (15 mrem/y) design guidance objective specified in 10 CFR Part 50, Appendix I.

2.2.8 Socioeconomic Factors

This section describes current socioeconomic factors that have the potential to be directly or indirectly affected by changes in operations at HNP. HNP and the communities that support it can be described as a dynamic socioeconomic system. The communities provide the people, goods, and services required by HNP operations. HNP operations, in turn, create the demand and pay for the people, goods, and services in the form of wages, salaries, and benefits for jobs and dollar expenditures for goods and services. The measure of the communities' ability to support the demands of HNP depends on their ability to respond to changing environmental, social, economic, and demographic conditions.

The socioeconomics region of influence (ROI) is defined by the areas where HNP employees and their families reside, spend their income, and use their benefits, thereby affecting the economic conditions of the region. The ROI consists of a two-county area (Wake and Lee counties), which is where approximately 82 percent of HNP employees reside. The following sections describe the housing, public services, offsite land use, visual aesthetics and noise, population demography, and the economy in the ROI surrounding the HNP site.

HNP employs a permanent workforce of around 470 permanent employees and up to 250 long-term contract employees (Progress Energy 2006f). Approximately 94 percent live in Chatham, Harnett, Johnston, Lee, and Wake counties, North Carolina (Table 2–6). The remaining 6 percent are divided among 11 other counties in North Carolina. Given the residential locations of HNP employees, the most significant impacts of plant operations are likely to occur in Wake and Lee counties where approximately 82 percent of the HNP employees reside. The focus of the analysis in this draft SEIS is therefore on the impacts of HNP in these two counties.

Table 2–6. HNP Permanent Employee Residence by County in 2006

County	Number of HNP Personnel	Percentage of Total
Chatham	21	4
Harnett	18	4
Johnston	17	4
Lee	75	16
Wake	311	66
Other	28	6

Total	470	100

Source: Progress Energy 2007f

HNP schedules refueling outages at nominal 18-month intervals. During refueling outages, site employment increases by 800 workers for temporary duty. Most of these workers are assumed to be located in the same geographic areas as the permanent HNP staff.

2.2.8.1 Housing

Table 2–7 lists the total number of occupied housing units, vacancy rates, and median value in the region of influence. According to the 2000 census, there were approximately 279,000 housing units in the ROI, of which approximately 261,000 were occupied. The median value of owner-occupied units was $162,900 in Wake County, which was higher than Lee County. The vacancy rate was also lower in Wake County (6.5 percent) and higher in Lee County (7.2 percent).

By 2005, the total number of housing units in Wake County grew by more than 55,000 units to more than 314,000 units. As a result, the number of available vacant housing units increased by more than 9,000 units to approximately 26,000 units or 8.3 percent of the available units (USCB 2007).

Table 2–7. Housing in Wake and Lee Counties, North Carolina, in 2000

	Wake	Lee	ROI
Total	258,953	19,909	278,862
Occupied housing units	242,040	18,466	260,506
Vacant units	16,913	1,443	18,356
Vacancy rate (percent)	6.5	7.2	6.6
Median value (dollars)	162,900	95,100	129,000

Source: USCB 2007

2.2.8.2 Public Services

This section presents a discussion of the public services of water supply, education, and transportation.

Water Supply

HNP does not use public water and is registered with the State of North Carolina as a user of water from Harris Reservoir for process, service, and domestic use, and provides onsite treatment for sanitary and process water and discharges effluent to Harris Reservoir under NPDES permit requirements.

Most HNP employees live in and around the communities of Raleigh, Cary, Apex, Holly Springs, Fuquay-Varina, and Sanford. The city of Raleigh's water treatment and distribution system serves more than 125,000 metered customers and 345,000 individuals (City of Raleigh 2004). The source of Raleigh's drinking water is Falls Lake, a 5018 ha (12,400 ac) impoundment northwest of the city that can provide up to 380 million liters (100 million gallons) of raw water a day to the city's E.M Johnson Water Plant (Raleigh Public Utilities 2006).

The towns of Cary and Apex use B. Everett Jordan Lake, located northwest of the town of Apex, as their source of drinking water (Town of Apex 2006; Town of Cary 2006). The towns of Cary and Apex co-own a water treatment facility that can treat up to 150 million liters (40 million gallons) per day. A study prepared in 2000 for the Town of Cary predicted that water demand would increase from 32.5 million liters (8.6 million gallons) per day (1998 value) to 101 million liters (26.7 million gallons) per day in 2028 (Town of Cary 2000).

The town of Holly Springs purchases water from the city of Raleigh and from Harnett County (Town of Holly Springs 2006). The town is presently allocated 4.5 million liters (1.2 million gallons) of water per day from the City of Raleigh and 7.6 million liters (2 million gallons) per day from Harnett County. Harnett County uses the Cape Fear River as its source of drinking water (Harnett County 2006). Holly Springs' water supply system is currently producing around 5.7 million liters (1.5 million gallons) per day and is capable of treating its entire allocation of 12.1 million liters (3.2 million gallons) of water per day. The town has a planned future capacity of 5.4 million liters (12 million gallons) per day using existing supply lines and a current storage capacity of 8.7 million liters (2.3 million gallons).

The town of Fuquay-Varina purchases its drinking water from the city of Raleigh and Harnett and Johnston counties which use the Cape Fear River (Raleigh, Harnett County) and Neuse River (Johnston County) as their sources of drinking water (Fuquay-Varina 2006). Current treatment capacity for the town is 10.4 million liters (2.75 million gallons) per day.

The city of Sanford uses the Cape Fear River system as its source for drinking water (City of Sanford 2005). The city's single water treatment plant is capable of producing 45.4 million liters (12 million gallons) of clean drinking water per day, and typically provides around 7.6 billion liters (2 billion gallons) of drinking water (20.8 million liters [5.5 million gallons] per day) to city residents annually.

Education

HNP is located in the Wake County Public School System, which is the second largest school system in North Carolina and had an enrollment of approximately 120,300 students in 2005. The Wake County Public School System, which includes the City of Raleigh, is composed of 9 school districts with 138 public schools (WCPSS 2007). In 2000, there were approximately 98,950 students enrolled in Wake County public schools (NCES 2007).

Transportation

Access to HNP is via U.S. 1 approximately 3.2 km (2 mi) south-southwest of the center of the town of New Hill and 1.6 km (1 mi) southeast of the town of Bonsal near the Chatham County-Wake County line (Figure 2-3). The plant's address is in New Hill.

Most HNP employees live in Sanford, Holly Springs, Apex, Cary, and Raleigh, and Fuquay-Varina (Progress Energy 2006b). Employees generally use state secondary and county roads to get to U.S. 1 and then to the HNP site (Figure 2-3). Travel in the vicinity of the HNP is limited to county roads by the presence of Harris Reservoir and B. Everett Jordan Lake. U.S. 1 provides the major highway link through the area and the only readily accessible access to the plant.

Traffic count data for roads in the vicinity of HNP is shown in Table 2-8. None of the roads listed have level-of-service determinations.

Table 2-8. Average Annual Daily Traffic (AADT) Counts in the Vicinity of HNP in 2003

Roadway and Location	Annual Average Daily Traffic (AADT)[a]
U.S. 1 – Entrance to HNP South of old US 1	17,000
U.S. 1 – near Apex	16,000
Old U.S. 1 – south of New Hill	1,800
Old U.S. 1 – just north of intersection with US 1	1,700
Old U.S. 1 – just north of Merry Oaks	2,300

Source: Progress Energy 2006b.

(a) All AADTs represent traffic volume during the average 24-hour day during 2003.

2.2.8.3 Offsite Land Use

North Carolina has experienced significant population and economic growth since the early 1990s. The state has been one of the fastest growing states in the nation, primarily as a result of in-migration (Brookings Institution 2000). This section describes Wake County current land use conditions because more than 99 percent of HNP's annual property taxes go to Wake County.

Wake County

Wake County is one of the fastest-growing counties in North Carolina. From 1990 to 2000, Wake County's population grew by approximately 204,500 persons, which is an increase of approximately 48 percent, while during the same 10-year period the population in the state of North Carolina increased by 21 percent (USCB 2001). At the same time, the number of housing units in Wake County increased by 46 percent, while the total number of units in the state increased by 25 percent (USCB 2007).

Wake County's comprehensive land use plan focuses on growth-related issues and the implementation of conservation efforts to protect natural resources. The plan reflects public involvement in the planning process and the desire to encourage growth while controlling patterns of development. Land use planning tools, such as zoning and population density limits, are used to control development. Wake County encourages growth in areas where public facilities, such as water and sewer systems, exist or are scheduled to be built in the future. Wake County has no growth control measures in the traditional sense. However, the County has created a Growth Management Task Force dedicated to the development of a comprehensive growth management strategy that will retain the quality of life experienced by residents within the region thus far.

Portions of Wake County lie within the Research Triangle, an area located between Duke University in Durham, North Carolina State University in Raleigh, and the University of North Carolina at Chapel Hill. Wake County occupies roughly 2155 km^2 (832 mi^2) of land area (USCB 2006). Currently, the county is 35 to 40 percent developed. The land use breakdown percentages for Wake County are as follows: 32.8 percent residential, 4.0 percent business/commercial, 2.0 percent industrial, 17.2 percent parks and public lands, 42.8 percent agricultural/undeveloped, and 2.2 percent "other" (Progress Energy 2006b). A report drafted by the Wake County Growth Management Task Force in 2002 noted that the county had experienced "rapid, exponential" growth in the 1990s and had a population of 678,751 in July 2002 (Wake County 2002). The report predicted that the county's population would increase by one-third over the ensuing 20 years, bringing the population "close" to one million. In 2006, however, the North Carolina State Demographer projected that the population of Wake County would exceed one million by 2015 and would be 1,133,110 by the year 2020 (NCOSBM 2006).

Initially, as rapid regional growth occurred, the county and its 12 municipalities continued a traditional approach of working independently to deliver services, to plan for futures, and to address growth-related impacts within their own borders. The county and municipalities each adopted their own land use plans, zoning and subdivision ordinances, and capital improvement programs (Wake County 2002).

By the late 1990s, the county was encountering significant growth-related changes resulting from rapid growth, including traffic jams, overcrowded schools, and loss of open space and natural areas. County and municipal officials identified the need for a more comprehensive effort to address growth concerns in Wake County. As a result, the Wake County Board of Commissioners formed the Wake County Growth Management Task Force to develop a county-wide plan for growth management.

Wake County has developed a county-wide land use plan, which also includes a special section devoted to the Harris Lake (Reservoir) Watershed. In the Wake County Land Use Plan (Wake County Planning Department 2003), the county has indicated that all land use planning should be based on the following broad goals:

- To guide quality growth throughout the County in conjunction with affected local governments.
- To encourage growth close to municipalities, to take advantage of existing and planned infrastructure, such as transportation, water and sewer facilities.
- To encourage the development of communities which provide adequate land for anticipated demands, in a pattern which allows a mixture of uses.
- To encourage maintenance of: open space, scenic aspects of rural areas, entrance ways to urban areas, and transition areas between urban areas.
- To encourage the conservation of environmentally significant areas and important natural and cultural resources.
- To allow owners of significant farmlands and forest lands the opportunity to maintain the productivity of their land.
- To ensure that the land use plan and transportation plan mutually support each other.
- To ensure that the County always protects the property rights of landowners.
- To maintain the quality and develop the capacity of surface water resources, using them for recreation sites, where appropriate.
- To prevent contamination of and maintain the capacity of groundwater resources.
- To ensure that local governments provide adequate, properly located land for recreational and leisure opportunities.

2.2.8.4 Visual Aesthetics and Noise

The site of the HNP is in a sparsely populated rural area of North Carolina characterized by gently rolling timbered hills. The HNP reactor is on a rolling plateau above Harris Reservoir. The major visible structures are the reactor building, the turbine building, the radiological waste building, the service and administration building, and the cooling tower. The HNP buildings are only visible in the immediate vicinity of the station due to the rolling terrain. The top of the cooling tower during both day and night are visible for a greater distance because they protrude above the hilltops.

Sources of noise from station operation include HNP's cooling tower, turbines, and large pumps and cooling water system motors. The turbines, pump, and motor noise have not exceeded ambient (baseline) levels in offsite areas and the noise is audible (exceeding ambient levels) for no more than a mile from the plant. Noise emissions during operations do not cause other than minor nuisance problems. However, noise levels in the vicinity of the plant may sometimes exceed the 55 dBA level that the EPA uses as a threshold level to protect against excess noise during outdoor activities. However, according to the EPA this threshold does "not constitute a standard, specification, or regulation," but was intended to provide a basis for state and local governments establishing noise standards.

2.2.8.5 Demography

According to the 2000 census, approximately 438,969 people lived within 32 km (20 mi) of HNP, which equates to a population density of (349 persons/mi^2) (Progress Energy 2006b). This density translates to the least sparse Category 4 (greater than or equal to 120 persons per square mile within 20 miles) using the GEIS measure of sparseness. Approximately 2,035,797 people live within 80 km (50 mi) of HNP (Progress Energy 2006b). This equates to a population density of (259 persons/mi^2). Applying the GEIS proximity measures, HNP is classified as proximity Category 4 (greater than or equal to 190 persons per square mile within 50 miles). Therefore, according to the sparseness and proximity matrix presented in the GEIS, the HNP ranks of sparseness Category 4 and proximity Category 4 result in the conclusion that HNP is located in a high population area.

Table 2-9 shows population projections and growth rates from 1970 to 2050 in Wake and Lee counties. According to the 2000 census, between 1990 and 2000, Wake County was the fastest growing county in North Carolina. It was ranked first out of 100 counties in the state and 22nd among 3,141 counties nationwide by the total number of residents added. Beyond 2000, the population in Wake County is projected to continue to grow steadily. In Lee County, the population also grew steadily between 1970 and 2000 and is projected to continue to grow but at a relatively lower rate compared to Wake County through 2050.

Table 2-9. Population and Percent Growth in Wake and Lee Counties, North Carolina, from 1970 to 2000 and Projected for 2010 to 2050

	Wake County		Lee County	
Year	**Population**	**Percent Growth**[(a)]	**Population**	**Percent Growth**[(a)]
1970	228,453	—	30,467	—
1980	301,327	31.9	36,718	20.5
1990	423,380	40.5	41,374	12.7
2000	627,846	48.3	49,040	18.5
2010	882,373	40.5	58,382	19.0
2020	1,133,110	28.4	67,180	15.1
2030	1,404,751	24.0	76,573	14.0
2040	1,521,813	8.3	82,283	7.5
2050	1,723,651	13.3	90,007	9.4

Sources: USCB 2007; NCSD 2007

— = No data available.

(a) Percent growth rate is calculated over the previous decade.

The 2000 demographic profile of the region of influence population is included in Table 2-10. Persons self-designated as minority individuals comprise 30.3 percent of the combined total population of these two counties. This minority population is composed largely of Black or African American and Hispanic and Latino residents.

Table 2-10. Demographic Profile of the Population in the HNP Region of Influence

	Wake County	Lee County	Region of Influence
Total Population	**627,846**	**49,040**	**676,886**
Race (2000) (percent of total population, Non-Hispanic or Latino)			
White	69.9	66.2	69.7
Black or African American	19.5	20.4	19.6
American Indian and Alaska Native	0.3	0.4	0.3
Asian	3.4	0.7	3.2
Native Hawaiian and Other Pacific Islander	0.0	0.0	0.0
Some other race	0.1	0.1	0.1
Two or more races	1.3	0.6	1.2
Ethnicity			
Hispanic or Latino	33,985	5,715	39,700
Percent of total population	5.4	11.7	5.9
Minority Population (including Hispanic or Latino ethnicity)			
Total minority population	188,686	16,573	205,259
Percent minority	30.1	33.8	30.3

Source: USCB 2007

Transient Population

Within 80 km (50 mi) of HNP, colleges and recreational opportunities attract daily and seasonal visitors who create demand for temporary housing and services. In 2000 in Wake County, 0.4 percent of all housing units are considered temporary housing for seasonal, recreational, or occasional use. By comparison, temporary housing accounts for only 0.7 percent and 3.8 percent of total housing units in Lee County and North Carolina, respectively (USCB 2007). In 2004, there were approximately 112,000 students attending colleges and universities within 80 kilometers (50 miles) of HNP (IES 2007).

Migrant Farm Worker

Migrant farm workers are individuals whose employment requires travel to harvest agricultural crops. These workers may or may not have a permanent residence. Some migrant workers may follow the harvesting of crops, particularly fruit, throughout the northeastern U.S. rural areas. Others may be permanent residents near HNP who travel from farm to farm harvesting crops.

Migrant workers may be members of minority or low-income populations. Because they travel and can spend a significant amount of time in an area without being actual residents, migrant workers may be unavailable for counting by census takers. If uncounted, these workers would be "underrepresented" in USCB minority and low-income population counts.

Wake and Lee counties host relatively small numbers of migrant workers. According to 2002 Census of Agriculture estimates, 882 temporary farm laborers (those working fewer than 150 days per year) were employed on 106 farms in Wake County, and 115 were employed on 26 farms in Lee County (USDA 2002).

2.2.8.6 Economy

This section contains a discussion of the economy, including employment and income, unemployment, and taxes.

Employment and Income

Between 2000 and 2005, the civilian labor force in the Wake County area increased 14.4 percent to the 2005 level of 408,977. The civilian labor force in the Lee County area grew 7.0 percent to the 2005 level of 25,825 (USCB 2007).

In 2005, employment in the services industry represented the largest sector of employment in both counties combined followed closely by construction and retail trade industries (Employment Security Commission of North Carolina 2007). The largest employer in Wake County in 2005 was the State of North Carolina with approximately 37,700 employees (see Table 2-11). The majority of employment in Wake County is located in the city of Raleigh.

Table 2-11. Major Employers in Wake County in 2005

Employer	Number of Employees	Employer	Number of Employees
State of North Carolina	37,671	City of Raleigh	3,000
Wake County Public School System	15,000	Research Triangle Institute	2,600
International Business Machines (IBM)	13,000	Cisco Systems	2,500

Employer	Number of Employees	Employer	Number of Employees
North Carolina State University	7,787	RTI International	2,260
WakeMed Health & Hospitals	6,500	US Environmental Protection Agency	2,000
GlaxoSmithKline, Inc.	4,800	Waste Industries, Inc.	2,000
Pinkerton & Burns	4,500	Verizon Wireless	1,600
SAS Institute, Inc.	4,300	First Citizens Bank & Trust Company	1,574
WakeMed Faculty Physician's Internal Medicine	4,000	Eaton Division/Headquarters	1,500
Rex Healthcare	3,800	Food Lion Stores	1,500
Progress Energy	3,400	Longistics International	1,500
Wake County	3,300	Misys Healthcare Systems	1,500
Nortel	3,150		

Source: Wake County 2007

Income information for Wake and Lee counties is presented in Table 2-12. According to the 2000 census, the median household and per capita income in Wake County was well above Lee County and the North Carolina average. Income levels in Lee County were slightly below but were very close to the state average. In 2000, only 7.8 percent of the population in Wake County was living below the official poverty level, while in Lee County, 12.8 percent of the population was living below the poverty level (USCB 2007).

Table 2-12. Income Information for the HNP Region of Influence

	Wake County	Lee County	North Carolina
Median household income 1999 (dollars)	54,988	38,900	39,184
Per capita income 1999 (dollars)	27,004	19,147	20,307
Percent of persons below the poverty line (2000)	7.8	12.8	12.3

Source: USCB 2007

Unemployment

In 2005, the annual unemployment average in the Wake and Lee counties were 5.1 and 5.5 percent, respectively, which were well below the annual unemployment average of 7.1 percent for North Carolina (USCB 2007).

Taxes

CP&L and North Carolina Eastern Municipal Power Agency (NCEMPA), the owners of HNP, pay property taxes to both Wake County and Chatham County, but the amounts paid to Chatham County are relatively small. From 2001 to 2004, the amount paid to Chatham County by CP&L ranged between $50,000 and $60,000 annually. For the same years, the NCEMPA amount ranged between $40,000 and $50,000 annually.

From 2001 through 2005, CP&L paid between $7.1 million and $8.4 million annually in property taxes to Wake County (see Table 2-13). Over the same period, the NCEMPA's property tax payments have represented less than one percent of Wake County's total real and personal property tax revenues (see Table 2-13). These payments represented between 1.9 and 2.6 percent of the county's total annual property tax revenue. Each year, Wake County collects these taxes, retains a portion for county operations, and disburses the remainder to the county's 12 cities or municipalities to fund their respective operating budgets (Progress Energy 2006b). Real and personal property tax revenues go into the county's General Fund. The property tax payments from CP&L and NCEMPA are primarily used by Wake County to pay for education and human services, as well as general administration, community, and environmental services, and public safety (Wake County 2004).

At present, the State of North Carolina General Assembly has taken no action on deregulation, which could, if enacted, affect tax payments to Wake County (Progress Energy 2006b). The Study Commission on the Future of Electric Service in North Carolina, which studied electric service choice for more than four years, decided in February 2002 to delay any action for the foreseeable future. Therefore, the potential effects of deregulation are not yet fully known. However, any changes to HNP property tax rates due to deregulation would be independent of license renewal (Progress Energy 2006b).

The continued availability of HNP and the associated tax base is an important feature in the ability of the Wake County and county municipalities to continue to invest in infrastructure and to draw industry and new residents.

Table 2-13. Wake County Tax Revenues, CP&L Property Tax, and NCEMPA Property Tax as a Percentage of Tax Revenues, 2001 to 2005

Year	Wake County Tax Revenues (in millions of dollars)	Property Tax Paid by Progress Energy (in millions of dollars)	Progress Energy Property Tax as Percentage of Tax Revenues	Property Tax Paid by NCEMPA (in millions of dollars)	NCEMPA Property Tax as Percentage of Tax Revenues
2001	323.5	7.1	2.2	2.1	Less than 1.0
2002	317.0	8.4	2.6	2.1	Less than 1.0
2003	354.1	7.4	2.1	2.0	Less than 1.0
2004	368.4	7.1	1.9	1.9	Less than 1.0
2005	389.3	8.4	2.2	1.8	Less than 1.0

Source: Progress Energy 2006b

2.2.9 Historic and Archaeological Resources

This section discusses the cultural background and the known historic and archaeological resources at the HNP site and in the surrounding area.

2.2.9.1 Cultural Background

The region around HNP contains prehistoric and historic Native American and Euro American cultural resources. The HNP ER mentions 29 properties listed in the National Register of Historic Places within approximately 9.6 km (6 mi) of HNP boundary (Progress Energy 2006b). These registered properties are primarily historic architectural resources but they also include archaeological resources. Five other locations within the 6 mile area are determined eligible for inclusion but are not yet listed in the Register. These locations are all historic architectural resources. Recorded archaeological sites in the area are predominantly the remains of prehistoric occupations but they also include remains of historic activities.

Paleo-Indians occupied North America from 10,000 to 12,000 years ago, living off the land and subsisting on large game, such as mammoths, that have since become extinct. In the North Carolina area, people lived in an environment that was wetter and cooler than today's. Paleo-Indians are typically considered to have been big game hunters. However, evidence from archaeological work in the state suggests that small game and plants played a significant role in the lifeways of the populations living in Paleo-Indian times. Stone tool styles show little variability over wide areas of North and South America, nevertheless raw material for these tools often have sources far from where the tools are found.

During the Archaic Period, from approximately 10,000 years ago until about 2,500 years ago, subsistence strategies underwent local changes to adapt to available resources. By the end of the Archaic Period, at a time when the climate reached its modern condition, archaeologists find more evidence of occupation suggesting an increased population density after the Paleo-Indian Period. Archaeologists interpret the settlement patterns they find as suggestive of an increase in the breadth of resources sought by prehistoric people as they lived in smaller territories. Archaic people collected, hunted, and gathered most of what they needed for survival in their home territory.

The Woodland Period, from approximately 3500 years ago to about 400 years ago, is viewed by North Carolina archaeologists as representative of a continuum of change in adaptation by prehistoric peoples. In the Woodland culture, Native Americans became regionally distinct cultural entities. Woodland people ultimately became dependent on maize agriculture, lived in villages, used the bow and arrow in hunting, and began to regularly make and use pottery. Archaeologists have gained no precise understanding of the transition from the Archaic to Woodland periods. The change seems to have been gradual and the remains for these occupations are often mixed in deposits that overlap each other. In the Woodland culture semi-permanent villages were most often located along stream valleys where conditions are best for agriculture (Claggett 1996).

Files maintained by the North Carolina Office of State Archaeology document 52 archaeological sites within lands owned by the applicant. All but one of the sites are found to date to the prehistoric time periods associated with the Archaic and Woodland periods (Patch 2006).

Beginning in the early seventeenth century contacts between Native American groups and new immigrants from the Old World were frequent and by the early eighteenth century immigrants began to flow into the area from European colonies in Virginia, Maryland, Pennsylvania, and North Carolina (Patch 2006). The Native Americans were displaced; either to join tribes outside the geographic area, move to small reservations (Claggett 1996), or they assimilated into the new settler’s European-American or African-American cultures.

The North Carolina Legislature established Wake County in 1771 (Corbett 1987). Agriculture remained the principal activity for colonists and their descendents through the eighteenth and nineteenth centuries. Upland as well as river and stream bottoms were farmed in this period though evidence of this is obscured by reforestation. At first the farming was for subsistence but as roads and railroads penetrated the area the importance of market agriculture increased. After the Civil War the agricultural emphasis changed from corn, dairy, hogs, and truck farming to crops such as tobacco and cotton that produced cash but exhausted the land (Patch 2006). Depleted and eroded soils led to a reduction in farming and a shift in population to more urban environments in the late nineteenth and early twentieth centuries.

2.2.9.2 Historic and Archaeological Resources

The HNP ER states "there are a number of cultural resources within or near the HNP boundaries" and that none of these are "listed on the National Register of Historic Places" (Progress Energy 2006b). NRC staff has confirmed historic and archaeological sites have been recorded at HNP (Patch 2006). In January 2006, the North Carolina State Historic Preservation Office (SHPO) wrote a letter to the applicant concerning HNP license renewal. The letter confirmed that they had "conducted a review of the project and are aware of no historic resources that would be affected" by the proposal to extend the operating license for HNP (NCDCR 2006).

A search of the archaeological site record files indicates that 51 prehistoric and one historic archaeological sites have been recorded on lands at HNP owned by the applicant. Most of these consist of low-density scatters of stone debris and tools in upland settings. The majority of the archaeological sites are small and badly disturbed. Additional historic and prehistoric archaeological sites remain undiscovered and unevaluated on the applicant's lands.

The SHPO, in letters concerned with the original construction of HNP and dated March 1978 and December 1979, acknowledges the location of archaeological sites on affected lands but comments that none of the recorded sites are "considered to be significant…due to damage and destruction caused by erosional processes" (NCDCR 1978).

2.2.10 Related Federal Project Activities and Consultations

The NRC staff reviewed the possibility that activities of other Federal agencies might impact the renewal of the operating license for HNP. Any such activity could result in cumulative environmental impacts and the possible need for a Federal agency to become a cooperating agency in the preparation of the HNP SEIS.

The NRC staff has determined that there are no Federal project activities that could result in cumulative impacts or would make it desirable for another Federal agency to become a cooperating agency for preparing this draft SEIS.

NRC is required under Section 102 of the National Environmental Policy Act of 1969 (NEPA) to consult with and obtain the comments of any Federal agency that has jurisdiction by law or special expertise with respect to any environmental impact involved. Federal agency comment correspondence is included in Appendix E.

2.2.10.1 Coastal Zone Management Act

In the United States, coastal areas are managed through the Coastal Zone Management Act of 1972 (CZMA). The Act, administered by the National Oceanic and Atmospheric Administration (NOAA) Office of Ocean and Coastal Resource Management, provides for management of the nation's coastal resources, including the Great Lakes, and balances economic development with environmental conservation. The Federal Consistency Regulations implemented by NOAA are contained in 15 CFR Part 930.

This law authorizes individual states to develop plans that incorporate the strategies and policies they will employ to manage development and use of coastal land and water areas. Each plan must be approved by NOAA. One of the components of an approved plan is "enforceable polices," by which a state exerts control over coastal uses and resources.

The North Carolina Coastal Management Program was approved by NOAA in 1981. The lead agency is the Division of Coastal Management within the Department of Environment and Natural Resources which implements and supervises all the various Coastal Zone Management programs in the state. North Carolina's coastal zone includes 20 coastal counties that in whole or in part are adjacent to, adjoining, intersected or bounded by the Atlantic Ocean or any coastal sound (NOAA 2007).

Federal Consistency requires "federal actions, occurring inside a state's coastal zone, that have a reasonable potential to affect the coastal resources or uses of that state's coastal zone, to be consistent with that state's enforceable coastal policies, to the maximum extent practicable".

HNP is located in Wake County, North Carolina. Wake County is not included in the list of North Carolina coastal counties which are subject to the rules and policies of the Division of Coastal Management, which administers the CZMA (NCDENR 2007c). License renewal of HNP does not require a State coastal consistency certification.

2.3 References

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10 CFR Part 50. *Code of Federal Regulations*, Title 10, *Energy*, Part 50, "Domestic Licensing of Production and Utilization Facilities."

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10 CFR Part 61. *Code of Federal Regulations*, Title 10, *Energy*, Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste."

10 CFR Part 71. *Code of Federal Regulations*, Title 10, *Energy*, Part 71, "Packaging and Transportation of Radioactive Material."

40 CFR Part 81. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 81, "Designation of Areas for Air Quality Planning Purposes."

40 CFR Part 190. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations."

40 CFR Part 260. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 260 "Hazardous Waste Management System: General."

40 CFR Part 261. *Code of Federal Regulations*, Title 40, *Protection of Environment,* Part 261, "Identification and Listing of Hazardous Waste."

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3.0 ENVIRONMENTAL IMPACTS OF REFURBISHMENT

Environmental issues associated with refurbishment activities are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).[(1)] The GEIS includes a determination of whether the analysis of the environmental issues could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required in this draft supplemental environmental impact statement (draft SEIS) unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1 and, therefore, additional plant-specific review of these issues is required.

License renewal actions may require refurbishment activities for the extended plant life. These actions may have an impact on the environment that requires evaluation, depending on the type of action and the plant-specific design. Environmental issues associated with refurbishment, which were determined to be Category 1 issues, are listed in Table 3-1.

Environmental issues related to refurbishment considered in the GEIS for which these conclusions could not be reached for all plants, or for specific classes of plants, are Category 2 issues. These are listed in Table 3-2.

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(1) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

Table 3-1. Category 1 Issues for Refurbishment Evaluation

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
Surface Water Quality, Hydrology, and Use (for all plants)	
Impacts of refurbishment on surface water quality	3.4.1
Impacts of refurbishment on surface water use	3.4.1
Aquatic Ecology (for all plants)	
Impacts of refurbishment on aquatic biota	3.5
Ground-water Use and Quality	
Impacts of refurbishment on ground-water use and quality	3.4.2
Land Use	
Impacts of refurbishment on Onsite land use	3.2
Human Health	
Radiation exposures to the public during refurbishment	3.8.1
Occupational radiation exposures during refurbishment	3.8.2
Socioeconomics	
Public services: public safety, social services, and tourism and recreation	3.7.4; 3.7.4.3; 3.7.4.4; 3.7.4.6
Aesthetic impacts (refurbishment)	3.7.8

Category 1 and Category 2 issues related to refurbishment that are not applicable to Shearon Harris Nuclear Power Plant, Unit 1 (HNP) because they are related to plant design features or site characteristics not found at the HPN site are listed in Appendix F.

The potential environmental effects of refurbishment actions would be identified, and the analysis would be summarized within this section, if such actions were planned. Carolina Power and Light Company (CP&L) indicated that it has performed an evaluation of systems, structures, and components pursuant to Section 54.21 of Title 10 of the *Code of Federal Regulations* (10 CFR 54.21) to identify the need to undertake any major refurbishment activities that are necessary to support continued operation of HNP during the requested 20-year period of extended operation. Items that are subject to aging and might require refurbishment to support continued operation during the renewal period are listed in Table B.2 of the GEIS.

Table 3-2. Category 2 Issues for Refurbishment Evaluation

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections	10 CFR 51.53 (c)(3)(ii) Subparagraph
TERRESTRIAL RESOURCES		
Impacts of refurbishment on terrestrial ecology	3.6	E
THREATENED OR ENDANGERED SPECIES (FOR ALL PLANTS)		
Threatened or endangered species	3.9	E
AIR QUALITY		
Air quality during refurbishment (nonattainment and maintenance areas)	3.3	F
SOCIOECONOMICS		
Housing impacts	3.7.2	I
Public services: public utilities	3.7.4.5	I
Public services: education (refurbishment)	3.7.4.1	I
Offsite land use (refurbishment)	3.7.5	I
Public services, transportation	3.7.4.2	J
Historic and archaeological resources	3.7.7	K
ENVIRONMENTAL JUSTICE		
Environmental justice	Not addressed[a]	Not addressed[a]

(a) Guidance related to environmental justice was not in place at the time the GEIS and the associated revision to 10 CFR Part 51 were prepared. If an applicant plans to undertake refurbishment activities for license renewal, environmental justice must be addressed in the applicant's environmental report and the NRC staff's environmental impact statement.

CP&L's evaluation of systems, structures, and components as required by 10 CFR 54.21 did not identified the need to undertake any major refurbishment or replacement actions associated with license renewal to support the continued operation of HNP beyond the end of the existing operating license. Therefore, refurbishment is not considered in this draft SEIS.

3.1 References

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy,* Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. *Code of Federal Regulation*s, Title 10, *Energy,* Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, Volumes 1 and 2. Office of Nuclear Regulatory Research, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plant*. NUREG-1437, Volume 1, Addendum 1. Office of Nuclear Reactor Regulation, Washington, D.C.

4.0 ENVIRONMENTAL IMPACTS OF OPERATION

Environmental issues associated with operation of a nuclear power plant during the renewal term are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).(1) The GEIS includes a determination of whether the analysis of the environmental issues could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.

(2) A single significance level (i.e., SMALL, MODERATE, OR LARGE) has been assigned to the impacts (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1, and therefore, additional plant-specific review of these issues is required.

This chapter addresses the issues related to operation during the renewal term that are listed in Table B-1 of Part 51 of Title 10 of the *Code of Federal Regulations* (10 CFR Part 51), Subpart A, Appendix B and are applicable to the Shearon Harris Nuclear Power Plant, Unit 1 (HNP). Section 4.1 addresses issues applicable to the HNP cooling system. Section 4.2 addresses issues related to transmission lines and onsite land use. Section 4.3 addresses the radiological impacts of normal operation, and Section 4.4 addresses issues related to the socioeconomic impacts of normal operation during the renewal term. Section 4.5 addresses issues related to groundwater use and quality, while Section 4.6 discusses the impacts of renewal-term operations on threatened and endangered species. Section 4.7 addresses potential new information that was raised during the scoping period, and Section 4.8 discusses cumulative impacts. The results

(1) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

of the evaluation of environmental issues related to operation during the renewal term are summarized in Section 4.9. Finally, Section 4.10 lists the references for Chapter 4. Category 1 and Category 2 issues that are not applicable to HNP because they are related to plant-design features or site characteristics not found at HNP are listed in Appendix F.

4.1 Cooling System

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B that are applicable to the HNP cooling system operation during the renewal term are listed in Table 4-1. Progress Energy stated in its Environmental Report (ER) that it is not aware of any new and significant information associated with the license renewal of HNP. The U.S. Nuclear Regulatory Commission (NRC) staff has not identified any new and significant information during its independent review of the Progress Energy ER (Progress Energy 2006b), the staff's site audit, the scoping process, or evaluation of other available information. Therefore, the NRC staff concludes that there would be no impacts related to these issues beyond those discussed in the GEIS. For all of the issues, the NRC staff concluded in the GEIS that the impacts would be SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

A brief description of the NRC staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

Table 4-1. Category 1 Issues Applicable to the Operation of the HNP Cooling System During the Renewal Term

ISSUE–10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Sections
SURFACE-WATER QUALITY, HYDROLOGY, AND USE	
Altered current patterns at intake and discharge structures	4.2.1.2.1
Altered thermal stratification of lakes	4.2.1.2.3
Temperature effects on sediment transport capacity	4.2.1.2.3
Scouring caused by discharged cooling water	4.2.1.2.3
Eutrophication	4.2.1.2.3
Discharge of chlorine or other biocides	4.2.1.2.4
Discharge of sanitary wastes and minor chemical spills	4.2.1.2.4
Discharge of other metals in wastewater	4.2.1.2.4

AQUATIC ECOLOGY	
Accumulation of contaminants in sediments or biota	4.2.1.2.4
Entrainment of phytoplankton and zooplankton	4.2.2.1.1
Cold shock	4.2.2.1.5
Thermal plume barrier to migrating fish	4.2.2.1.6
Distribution of aquatic organisms	4.2.2.1.6
Premature emergence of aquatic insects	4.2.2.1.7
Gas supersaturation (gas bubble disease)	4.2.2.1.8
Low dissolved oxygen in the discharge	4.2.2.1.9
Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses	4.2.2.1.10
Stimulation of nuisance organisms	4.2.2.1.11
AQUATIC ECOLOGY (PLANTS WITH COOLING-TOWER-BASED HEAT DISSIPATION SYSTEMS)	
Entrainment of fish and shellfish in early life stages	4.3.3
Impingement of fish and shellfish	4.3.3
Heat shock	4.3.3
TERRESTRIAL RESOURCES	
Cooling-tower impacts on crops and ornamental vegetation	4.3.4
Cooling-tower impacts on native plants	4.3.5.1
Bird collisions with cooling towers	4.3.5.2
HUMAN HEALTH	
Microbiological organisms (occupational health)	4.3.6
Noise	4.3.7

- <u>Altered current patterns at intake and discharge structures.</u> Based on information in the GEIS, the Commission found that

  > Altered current patterns have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of altered current patterns at intake and discharge structures during the renewal term beyond those discussed in the GEIS.

- Altered thermal stratification of lakes. Based on information in the GEIS, the Commission found that

  > Generally, lake stratification has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

  The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of altered thermal stratification of lakes during the renewal term beyond those discussed in the GEIS.

- Temperature effects on sediment transport capacity. Based on information in the GEIS, the Commission found that

  > These effects have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of temperature effects on sediment transport capacity during the renewal term beyond those discussed in the GEIS.

- Scouring caused by discharged cooling water. Based on information in the GEIS, the Commission found that

  > Scouring has not been found to be a problem at most operating nuclear power plants and has caused only localized effects at a few plants. It is not expected to be a problem during the license renewal term.

  The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of scouring caused by discharged cooling water during the renewal term beyond those discussed in the GEIS.

- Eutrophication. Based on information in the GEIS, the Commission found that

  > Eutrophication has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information including plant monitoring data and technical reports. Therefore, the NRC staff concludes there would be no impacts of eutrophication during the renewal term beyond those discussed in the GEIS.

- Discharge of chlorine or other biocides. Based on information in the GEIS, the Commission found that

> Effects are not a concern among regulatory and resource agencies, and are not expected to be a problem during the license renewal term.

The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of discharge of chlorine or other biocides during the renewal term beyond those discussed in the GEIS.

- Discharge of sanitary wastes and minor chemical spills. Based on information in the GEIS, the Commission found that

> Effects are readily controlled through [National Pollutant Discharge Elimination System] NPDES permit and periodic modifications, if needed, and are not expected to be a problem during the license renewal term.

The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of discharges of sanitary wastes and minor chemical spills during the renewal term beyond those discussed in the GEIS.

- Discharge of other metals in wastewater. Based on information in the GEIS, the Commission found that

> These discharges have not been found to be a problem at operating nuclear power plants with cooling-tower-based heat dissipation systems and have been satisfactorily mitigated at other plants. They are not expected to be a problem during the license renewal term.

The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of discharges of other metals in wastewater during the renewal term beyond those discussed in the GEIS.

- Accumulation of contaminants in sediments or biota. Based on information in the GEIS, the Commission found that

  > Accumulation of contaminants has been a concern at a few nuclear power plants but has been satisfactorily mitigated by replacing copper alloy condenser tubes with those of another metal. It is not expected to be a problem during the license renewal term.

  The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of available information. Therefore, the NRC staff concludes there would be no impacts of accumulation of contaminants in sediments or biota during the renewal term beyond those discussed in the GEIS.

- Entrainment of phytoplankton and zooplankton. Based on information in the GEIS, the Commission found that

  > Entrainment of phytoplankton and zooplankton has not been found to be a problem at operating nuclear power plants and is not expected to be a problem during the license renewal term.

  The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, the review of monitoring programs, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of entrainment of phytoplankton and zooplankton during the renewal term beyond those discussed in the GEIS.

- Cold shock. Based on information in the GEIS, the Commission found that

  > Cold shock has been satisfactorily mitigated at operating nuclear plants with once-through cooling systems, has not endangered fish populations or been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds, and is not expected to be a problem during the license renewal term.

  The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of cold shock during the renewal term beyond those discussed in the GEIS.

- Thermal plume barrier to migrating fish. Based on information in the GEIS, the Commission found that

  > Thermal plumes have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of thermal plume barriers on migrating fish during the renewal term beyond those discussed in the GEIS.

- Distribution of aquatic organisms. Based on information in the GEIS, the Commission found that

  > Thermal discharge may have localized effects but is not expected to affect the larger geographical distribution of aquatic organisms.

  The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, the review of monitoring programs, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts on distribution of aquatic organisms during the renewal term beyond those discussed in the GEIS.

- Premature emergence of aquatic insects. Based on information in the GEIS, the Commission found that

  > Premature emergence has been found to be a localized effect at some operating nuclear power plants but has not been a problem and is not expected to be a problem during the license renewal term.

  The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of premature emergence of aquatic insects during the renewal term beyond those discussed in the GEIS.

- Gas supersaturation (gas bubble disease). Based on information in the GEIS, the Commission found that

  > Gas supersaturation was a concern at a small number of operating nuclear power plants with once-through cooling systems but has been satisfactorily mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of gas supersaturation during the renewal term beyond those discussed in the GEIS.

- <u>Low dissolved oxygen in the discharge</u>. Based on information in the GEIS, the Commission found that

  > Low dissolved oxygen has been a concern at one nuclear power plant with a once-through cooling system but has been effectively mitigated. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

  The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, the review of monitoring programs, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of low dissolved oxygen during the renewal term beyond those discussed in the GEIS.

- <u>Losses from predation, parasitism, and disease among organisms exposed to sublethal stresses</u>. Based on information in the GEIS, the Commission found that

  > These types of losses have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

  The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of losses from predation, parasitism, and disease among organisms exposed to sublethal stresses during the renewal term beyond those discussed in the GEIS.

- <u>Stimulation of nuisance organisms</u>. Based on information in the GEIS, the Commission found that

  > Stimulation of nuisance organisms has been satisfactorily mitigated at the single nuclear power plant with a once-through cooling system where previously it was a problem. It has not been found to be a problem at operating nuclear power plants with cooling towers or cooling ponds and is not expected to be a problem during the license renewal term.

  The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of stimulation of nuisance organisms during the renewal term beyond those discussed in the GEIS.

- Entrainment of fish and shellfish in early life stages (cooling-tower-based heat dissipation). Based on information in the GEIS, the Commission found that

    > Entrainment of fish has not been found to be a problem at operating nuclear power plants with this type of cooling system and is not expected to be a problem during the license renewal term.

    The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of entrainment of fish and shellfish in early life stages for cooling-tower-based systems during the renewal term beyond those discussed in the GEIS.

- Impingement of fish and shellfish (cooling-tower-based heat dissipation). Based on information in the GEIS, the Commission found that

    > The impingement has not been found to be a problem at operating nuclear power plants with this type of cooling system and is not expected to be a problem during the license renewal term.

    The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of impingement of fish and shellfish for cooling-tower-based systems during the renewal term beyond those discussed in the GEIS.

- Heat shock (cooling-tower-based heat dissipation). Based on information in the GEIS, the Commission found that

    > Heat shock has not been found to be a problem at operating nuclear power plants with this type of cooling system and is not expected to be a problem during the license renewal term.

    The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of heat shock for cooling-tower-based systems during the renewal term beyond those discussed in the GEIS.

- Cooling-tower impacts on crops and ornamental vegetation. Based on information in the GEIS, the Commission found that

> Impacts from salt drift, icing, fogging, or increased humidity associated with cooling-tower operation have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the renewal term.

The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no cooling-tower impacts on crops and ornamental vegetation during the renewal term beyond those discussed in the GEIS.

- Cooling-tower impacts on native vegetation. Based on information in the GEIS, the Commission found that

> Impacts from salt drift, icing, fogging, or increased humidity associated with cooling-tower operation have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the renewal term.

The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no cooling-tower impacts on native vegetation during the renewal term beyond those discussed in the GEIS.

- Bird collisions with cooling towers. Based on information in the GEIS, the Commission found that

> These collisions have not been found to be a problem at operating nuclear power plants and are not expected to be a problem during the license renewal term.

The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of bird collisions with cooling towers during the renewal term beyond those discussed in the GEIS.

- Microbiological organisms (occupational health). Based on information in the GEIS, the Commission found that

> Occupational health impacts are expected to be controlled by continued application of accepted industrial hygiene practices to minimize worker exposures.

The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of microbiological organisms during the renewal term beyond those discussed in the GEIS.

- Noise. Based on information in the GEIS, the Commission found that

> Noise has not been found to be a problem at operating plants and is not expected to be a problem at any plant during the license renewal term.

The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes there would be no impacts of noise during the renewal term beyond those discussed in the GEIS.

There are no Category 2 issues related to cooling system operation during the renewal term that are applicable to HNP.

4.2 Transmission Lines

The transmission lines and right-of-way (ROW) maintenance are described in Section 2.1.7 of this draft supplemental environmental impact statement (SEIS). The transmission lines connect to five substations: Siler City, Erwin, Wake, Apex, and Fort Bragg-Woodruff Street and to one power plant, the Cape Fear Plant. The seven transmission lines total 229 km (142 mi) in length and their ROW occupy 695 ha (1717 ac) (Progress Energy 2006b).

Progress Energy controls vegetation in transmission line ROWs using an Integrated Vegetation Management approach, which includes both mechanical and chemical maintenance methods. Procedures are in place to ensure protection of terrestrial and aquatic resources, as well as protection against human exposure to herbicides and pesticides.

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, that are applicable to the HNP transmission lines are listed in Table 4-2. Progress Energy stated in its Environmental Report (ER) that it is not aware of any new and significant information associated with the renewal of the HNP operating license (Progress Energy 2006b). The NRC staff has not identified any new and significant information during its independent review of the Progress Energy ER, the staff's site audit, the scoping process, or the evaluation of other information. Therefore, the NRC staff concludes that there would be no impacts related to these issues beyond those discussed in the GEIS (NRC 1996). For all those issues, the NRC staff concluded in the GEIS that the impacts would be SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

Table 4-2. Category 1 Issues Applicable to the Shearon Harris Nuclear Power Plant Transmission Lines During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
TERRESTRIAL RESOURCES	
Power line right-of-way management (cutting and herbicide application)	4.5.6.1
Bird collisions with power lines	4.5.6.2
Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock)	4.5.6.3
Floodplains and wetland on power line right of way	4.5.7
AIR QUALITY	
Air quality effects of transmission lines	4.5.2
LAND USE	
Onsite land use	4.5.3
Power line right-of-way	4.5.3

A brief description of the staff's review and GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Power line right-of-way management (cutting and herbicide application). Based on information in the GEIS, the Commission found that

  > The impacts of right-of-way maintenance on wildlife are expected to be of small significance at all sites.

  The NRC staff has not identified any new and significant information during its review of the Progress Energy ER, the staff's site audit, the scoping process, or the evaluation of other information. Therefore, the NRC staff concludes there would be no impacts of power line ROW maintenance during the renewal term beyond those discussed in the GEIS.

- Bird collisions with power lines. Based on information in the GEIS, the Commission found that

  > Impacts are expected to be of small significance at all sites.

  The NRC staff has not identified any new and significant information during its review of the Progress Energy ER, the staff's site audit, the scoping process, or the evaluation of other information. Therefore, the NRC staff concludes there would be no impacts of bird collisions with power lines during the renewal term beyond those discussed in the GEIS.

- Impacts of electromagnetic fields on flora and fauna (plants, agricultural crops, honeybees, wildlife, livestock). Based on information in the GEIS, the Commission found that

  > No significant impacts of electromagnetic fields on terrestrial flora and fauna have been identified. Such effects are not expected to be a problem during the license renewal term.

  The NRC staff has not identified any new and significant information during its review of the Progress Energy ER, the staff's site audit, the scoping process, or the evaluation of other information. Therefore, the NRC staff concludes there would be no impacts of electromagnetic fields on flora and fauna during the renewal term beyond those discussed in the GEIS.

- Floodplains and wetland on power line right-of-way. Based on information in the GEIS, the Commission found that

  > Periodic vegetation control is necessary in forested wetlands underneath power lines and can be achieved with minimal damage to the wetland. No significant impact is expected at any nuclear power plant during the license renewal term.

  The NRC staff has not identified any new and significant information during its review of the Progress Energy ER, the staff's site audit, the scoping process, or the evaluation of other information. Therefore, the NRC staff concludes there would be no impacts of power line ROW on floodplains and wetlands during the renewal term beyond those discussed in the GEIS.

- Air quality effects of transmission lines. Based on the information in the GEIS, the Commission found that

  > Production of ozone and oxides of nitrogen is insignificant and does not contribute measurably to ambient levels of these gases.

  The NRC staff has not identified any new and significant information during its review of the Progress Energy ER, the staff's site audit, the scoping process, or the evaluation of other information. Therefore, the NRC staff concludes there would be no impacts of air quality effects of transmission lines during the renewal term beyond those discussed in the GEIS.

- Onsite land use. Based on the information in the GEIS, the Commission found that

  > Projected onsite land use changes required during … the renewal period would be a small fraction of any nuclear power plant site and would involve land that is controlled by the applicant.

The NRC staff has not identified any new and significant information during its review of the Progress Energy ER, the staff's site audit, the scoping process, or the evaluation of other information. Therefore, the NRC staff concludes there would be no impacts of onsite land use during the renewal term beyond those discussed in the GEIS.

- Power line right-of-way. Based on information in the GEIS, the Commission found that

> Ongoing use of power line right-of-ways would continue with no change in restrictions. The effects of these restrictions are of small significance.

The NRC staff has not identified any new and significant information during its review of the Progress Energy ER, the staff's site audit, the scoping process, or the evaluation of other information. Therefore, the NRC staff concludes there would be no impacts of power line ROWs during the renewal term beyond those discussed in the GEIS.

The NRC staff has identified one Category 2 issue and one uncategorized issue related to transmission lines. These issues are listed in Table 4-3 and are discussed in Sections 4.2.1 and 4.2.2.

Table 4-3. Category 2 and Uncategorized Issues Applicable to the Shearon Harris Nuclear Power Plant Transmission Lines During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
HUMAN HEALTH			
Electromagnetic fields, acute effects (electric shock)	4.5.4.1	H	4.2.1
Electromagnetic fields, chronic effects	4.5.4.2	NA	4.2.2

4.2.1 Electromagnetic Fields – Acute Effects

Based on the GEIS, the Commission found that electric shock resulting from direct access to energized conductors or from induced charges in metallic structures has not been found to be a problem at most operating plants and generally is not expected to be a problem during the license renewal term. However, site-specific review is required to determine the significance of the electric shock potential along the portions of the transmission lines that are within the scope of this draft SEIS.

In the GEIS (NRC 1999), the NRC staff found that without a review of the conformance of each nuclear plant transmission line with National Electrical Safety Code (NESC; IEEE 1997) criteria, it was not possible to determine the significance of the electric shock potential. Evaluation of individual plant transmission lines is necessary because the issue of electric shock safety was not addressed in the licensing process for some plants. For other plants, land use in the vicinity of transmission lines may have changed, or power distribution companies may have chosen to upgrade line voltage. To comply with 10 CFR 51.53(c)(3)(ii)(H), the applicant must provide an assessment of the potential shock hazard if the transmission lines that were constructed for the specific purpose of connecting the plant to the transmission system do not meet the recommendations of the NESC for preventing electric shock from induced currents.

CP&L designed and constructed all HNP transmission lines in accordance with industry guidance that was current when the lines were built. Ongoing surveillance and maintenance of HNP-related transmission facilities ensure continued conformance to design standards (Progress Energy 2006b). In the current configuration of the transmission system, seven 230-kV transmission lines connect HNP to the regional grid. All lines emanating from HNP were designed, constructed, and are operated in compliance with the applicable sections of the NESC, including the most recent edition. These lines generally run through 100-foot-wide corridors, but in some areas, such as the area immediately south of HNP, corridors are as wide as 350 feet (Progress Energy 2006b). These lines meet the requirements that have been in effect since 1977 when the NESC adopted a provision that became part of the NESC Code for lines exceeding 98 kV alternating current to ground; this provision limits "the steady state current due to electrostatic effects to 5 mA if the largest anticipated truck, vehicle or equipment under the line were short-circuited to ground" (Progress Energy 2006b). This current is induced in vehicles by the transmission line electric field and is proportional to the voltage of the line and inversely proportional to the distance from the line.

By using a computer code called ACDCLINE (Rev. 3.0) that was produced by the Electric Power Research Institute (Progress Energy 2006b), Progress Energy calculated electric field strength and induced current that is produced by its transmission lines. The results of this computer program have been field-verified through electrostatic field measurements by several utilities. Input parameters included the design features of the limiting-case scenario, the NESC requirement that line sag be determined at 120ºF conductor temperature, and the maximum vehicle size under the lines as a tractor-trailer.

The analysis determined that none of the transmission lines has the capacity to induce as much as 5 mA in a vehicle parked beneath the lines. The calculated induced currents ranged from 1.1 to 3.1 mA (Progress Energy 2006b), but in reality, the induced currents would be lower because the calculations were performed with the conservative assumption that the line sag was determined at 212ºF conductor temperature, instead of at the required 120ºF.

In the GEIS (NRC 1999), the NRC staff found that electrical shock is of SMALL significance for transmission lines that are operated in adherence with the NESC criteria for limiting hazards.

The NRC staff identified potential mitigation measures, including installing road signs at road crossings and increased clearances. Based on a review of the available information, including that provided in the ER (Progress Energy 2006b), the NRC staff's site audit, the scoping process, and an evaluation of other information, the staff concludes that the potential impacts for electric shock during the renewal term are SMALL.

4.2.2 Electromagnetic Fields – Chronic Effects

In the GEIS, the chronic effects of 60-Hz electromagnetic fields from power lines were not designated as Category 1 or 2, and will not be until a scientific consensus is reached on the health implications of these fields.

The potential for chronic effects from these fields continues to be studied and is not known at this time. The National Institute of Environmental Health Sciences (NIEHS) directs related research through the U.S. Department of Energy (DOE). A NIEHS report (NIEHS 1999) contains the following conclusion:

> The NIEHS concludes that ELF-EMF [extremely low frequency-electromagnetic field] exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or non-cancer health outcomes provide sufficient evidence of a risk to currently warrant concern.

This statement is not sufficient to cause the NRC staff to change its position with respect to the chronic effects of electromagnetic fields. Footnote 4 to Table B-1 states:

> If in the future, the Commission finds that, contrary to current indications, a consensus has been reached by appropriate Federal health agencies that there are adverse health effects from electromagnetic fields, the Commission will require applicants to submit plant-specific reviews of those health effects as part of their license renewal applications. Until such time, applicants for license renewal are not required to submit information on this issue.

The staff considers the GEIS finding of "Uncertain" still appropriate and will continue to follow developments on this issue.

4.3 Radiological Impacts of Normal Operations

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to HNP in regard to radiological impacts are listed in Table 4-4. Progress Energy stated in its ER that it is not aware of any new and significant information associated with the license renewal of HNP. The NRC staff has not identified any new and significant information during its review of the HNP ER (Progress Energy 2006b), the staff's site audit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes there are no impacts related to these issues beyond those discussed in the GEIS. For these issues, the NRC staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 4-4. Category 1 Issues Applicable to Radiological Impacts of Normal Operations During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
HUMAN HEALTH	
Radiation exposures to public (license renewal term)	4.6.2
Occupational radiation exposures (license renewal term)	4.6.3

A brief description of the staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Radiation exposures to public (license renewal term). Based on information in the GEIS, the Commission found that

  > Radiation doses to the public will continue at current levels associated with normal operations.

  The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes there are no impacts of radiation exposures to the public during the renewal term beyond those discussed in the GEIS.

- Occupational radiation exposures (license renewal term). Based on information in the GEIS, the Commission found that

  > Projected maximum occupational doses during the license renewal term are within the range of doses experienced during normal operations and normal maintenance outages, and would be well below regulatory limits.

The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes there are no impacts of occupational radiation exposures during the renewal term beyond those discussed in the GEIS.

There are no Category 2 issues related to radiological impacts of routine operations.

4.4 Socioeconomic Impacts of Plant Operations During the License Renewal Term

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B–1 that are applicable to socioeconomic impacts during the renewal term are listed in Table 4–5. As stated in the GEIS, the impacts associated with these Category 1 issues were determined to be SMALL, and plant-specific mitigation measures would not be sufficiently beneficial to be warranted.

The NRC staff reviewed and evaluated the HNP ER (Progress Energy 2006b), scoping comments, other available information, and visited the HNP site in search of new and significant information that would change the conclusions presented in the GEIS. No new and significant information was identified during this review. Therefore, it is expected that there would be no impacts related to these Category 1 issues during the renewal term beyond those discussed in the GEIS.

Table 4–5. Category 1 Issues Applicable to Socioeconomics During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
SOCIOECONOMICS	
Public services: public safety, social services, and tourism and recreation	4.7.3; 4.7.3.3; 4.7.3.4; 4.7.3.6
Public services: education (license renewal term)	4.7.3.1
Aesthetic impacts (license renewal term)	4.7.6
Aesthetic impacts of transmission lines (license renewal term)	4.5.8

A brief description of the NRC staff's review and the GEIS conclusions, as codified in Table B-1, for each of these issues follows:

- Public services: public safety, social services, and tourism and recreation. Based on information in the GEIS, the Commission found that

    Impacts to public safety, social services, and tourism and recreation are expected to be of small significance at all sites.

    The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes there are no impacts on public safety, social services, and tourism and recreation during the renewal term beyond those discussed in the GEIS.

- Public services: education (license renewal term). Based on information in the GEIS, the Commission found that

    Only impacts of small significance are expected.

    The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes there are no impacts on education during the renewal term beyond those discussed in the GEIS.

- Aesthetic impacts (license renewal term). Based on information in the GEIS, the Commission found that

    No significant impacts are expected during the license renewal term.

    The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes there are no aesthetic impacts during the renewal term beyond those discussed in the GEIS.

- Aesthetic impacts of transmission lines (license renewal term). Based on information in the GEIS, the Commission found that

    No significant impacts are expected during the license renewal term.

    The NRC staff has not identified any new and significant information during its review of the HNP ER, the staff's site audit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes there are no aesthetic impacts of transmission lines during the renewal term beyond those discussed in the GEIS.

Table 4–6 lists the Category 2 socioeconomic issues, which require plant-specific analysis, and environmental justice, which was not addressed in the GEIS.

Table 4–6. Category 2 Issues Applicable to Socioeconomics and Environmental Justice During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
SOCIOECONOMICS			
Housing impacts	4.7.1	I	4.4.1
Public services: public utilities	4.7.3.5	I	4.4.2
Offsite land use (license renewal term)	4.7.4	I	4.4.3
Public services: transportation	4.7.3.2	J	4.4.4
Historic and archaeological resources	4.7.7	K	4.4.5
Environmental justice	Not addressed[a]	Not addressed[a]	4.4.6

(a) Guidance related to environmental justice was not in place at the time the GEIS and the associated revision to 10 CFR Part 51 were prepared. Therefore, environmental justice must be addressed in plant-specific reviews.

4.4.1 Housing Impacts

Appendix C of the GEIS presents a population characterization method based on two factors, sparseness and proximity (GEIS, Section C.1.4). Sparseness measures population density within 32 km (20 mi) of the site, and proximity measures population density and city size within 80 km (50 mi). Each factor has categories of density and size (GEIS, Table C.1). A matrix is used to rank the population category as low, medium, or high (GEIS, Figure C.1).

According to the 2000 census, approximately 438,969 people lived within 32 km (20 mi) of HNP, which equates to a population density of 349 persons per square mile (Progress Energy 2006b). This density translates to the least sparse Category 4 (greater than or equal to 120 persons per square mile within 20 miles). Approximately 2,035,797 people live within 80 km (50 mi) of HNP (Progress Energy 2006b). This equates to a population density of 259 persons per square mile. Applying the GEIS proximity measures, HNP is classified as proximity Category 4 (greater than or equal to 190 persons per square mile within 50 miles). Therefore, according to the sparseness and proximity matrix presented in the GEIS, the HNP ranks of sparseness Category 4 and proximity Category 4 result in the conclusion that HNP is located in a high population area.

Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, states that impacts on housing availability are expected to be of small significance in medium or high-density population areas where growth-control measures are not in effect. Since HNP is located in a high population area and Wake and Lee counties are not subject to growth-control measures that would limit housing development, any HNP employment-related impact on housing availability would likely be small. Since CP&L has indicated that there would be no major plant refurbishment and no non-outage employees would be added to support HNP operations during the license renewal term, employment levels at HNP would remain relatively constant with no additional demand for housing during the license renewal term. In addition, the number of available housing units has kept pace with or exceeded the low growth in the area population. Based on this information, there would be no impact on housing during the license renewal term and mitigation measures need not be considered.

4.4.2 Public Services: Public Utility Impacts

Impacts on public utility services are considered SMALL if there is little or no change in the ability of the system to respond to demand and thus there is no need to add capital facilities. Impacts are considered MODERATE if service capabilities are overtaxed during periods of peak demand. Impacts are considered LARGE if services (e.g., water, sewer) are substantially degraded and additional capacity is needed to meet ongoing demand. The GEIS indicated that, in the absence of new and significant information to the contrary, the only impacts on public utilities that could be significant are impacts on public water supplies.

Analysis of impacts on the public water and sewer systems considered both plant demand and plant-related population growth. Section 2.2.2 of this draft SEIS describes the HNP permitted withdrawal rate and actual use of water.

As discussed in Section 2.2.8.2, HNP does not use water provided by any outside public water source. HNP is registered with the State of North Carolina as a user of water from Harris Reservoir for process, service, and domestic use, and provides onsite treatment for sanitary and process water and discharges effluent to Harris Reservoir under National Pollutant Discharge Elimination System (NPDES) permit requirements. CP&L has identified no operational changes during the HNP license renewal term that would alter the plant water use source. Water usage by HNP has not stressed system capacity and is not currently an issue. CP&L also has no plans to increase HNP staffing due to refurbishment or plant aging management activities, and has identified no operational changes during the license renewal term that would increase plant water use.

HNP operations during the license renewal term would not increase plant-related population demand for public water and sewer services. Since CP&L has indicated that there would be no major plant refurbishment, overall employment levels at HNP would remain relatively constant during this period with no additional demand for public services. In addition, both public and private water systems in the region would be adequate to provide the capacity and to meet the demand of residential and industrial customers in the area. Because HNP has no groundwater production wells and obtains no drinking water from public water suppliers, it has no effect on local or regional public drinking water supply capacities. Similarly, HNP treats its own sanitary and process wastes and has no effect on the capacities or availability of local or regional sewage treatment facilities. Therefore, there would be no impact to public water and sewer services during the license renewal term, and mitigation measures need not be considered.

4.4.3 Offsite Land Use – License Renewal Period

Offsite land use during the license renewal term is a Category 2 issue (10 CFR 51, Subpart A, Appendix B, Table B-1). Table B-1 of 10 CFR 51 Subpart A, Appendix B notes that "significant changes in land use may be associated with population and tax revenue changes resulting from license renewal."

Section 4.7.4 of the GEIS defines the magnitude of land-use changes as a result of plant operation during the license renewal term as follows:

SMALL - Little new development and minimal changes to an area's land-use pattern.

MODERATE - Considerable new development and some changes to the land-use pattern.

LARGE - Large-scale new development and major changes in the land-use pattern.

Tax revenue can affect land use because it enables local jurisdictions to provide the public services (e.g., transportation and utilities) necessary to support development. Section 4.7.4.1 of the GEIS states that the assessment of tax-driven land-use impacts during the license renewal term should consider (1) the size of the plant's payments relative to the community's total revenues, (2) the nature of the community's existing land-use pattern, and (3) the extent to which the community already has public services in place to support and guide development. If the plant's tax payments are projected to be small relative to the community's total revenue, tax-driven land-use changes during the plant's license renewal term would be SMALL, especially where the community has pre-established patterns of development and has provided adequate public services to support and guide development. Section 4.7.2.1 of the GEIS states that if tax payments by the plant owner are less than 10 percent of the taxing jurisdiction's revenue, the significance level would be SMALL. If the plant's tax payments are projected to be medium to large relative to the community's total revenue, new tax-driven land-use changes would be MODERATE. If the plant's tax payments are projected to be a dominant source of the community's total revenue, new tax-driven land-use changes would be LARGE. This would be especially true where the community has no pre-established pattern of development or has not provided adequate public services to support and guide development.

4.4.3.1 Population-Related Impacts

Since CP&L has no plans to add non-outage employees during the license renewal period, there would be no noticeable change in land use conditions in the vicinity of the HNP site. Therefore, there would be no land use impacts during the license renewal term and mitigation measures need not be considered.

4.4.3.2 Tax-Revenue-Related Impacts

CP&L and North Carolina Eastern Municipal Power Agency (NCEMPA) pay annual real estate taxes to both Wake and Chatham counties. From 2001 through 2005, CP&L and NCEMPA annually paid between $7.1 and $8.4 million and $1.8 and $2.1 million, respectively, in property taxes to Wake County. This represented between 1.9 and 2.6 percent and less than 1 percent, respectively, of the county's annual total real and personal property tax revenues. Real and personal property tax revenues go into the county's General Fund. The amount paid to Chatham County during this time period by CP&L ranged between $50,000 and $60,000 annually, and NCEMPA paid between $40,000 and $50,000 annually.

At present, the State of North Carolina has taken no action on deregulation, which could, if enacted, affect tax payments to both Wake and Chatham counties. However, any changes to HNP property tax rates due to deregulation would be independent of license renewal. Discontinuing the current level of tax revenues would have a significant negative economic impact on the county.

CP&L has indicated that there would be no major plant refurbishment or license renewal-related construction activities necessary to support the continued operation of the HNP beyond the end of the existing operating license term during the license renewal period. Accordingly, there would be no increase in the assessed value of HNP and annual property taxes to Wake and Chatham counties would remain relatively constant throughout the license renewal period. Based on this information, there would be no tax revenue-related land-use impacts during the license-renewal term and mitigation measures need not be considered.

4.4.4 Public Services: Transportation Impacts During Operations

Table B-1, 10 CFR Part 51 states:

> Transportation impacts (level of service) of highway traffic generated... during the term of the renewed license are generally expected to be of small significance. However, the increase in traffic associated with additional workers and the local road and traffic control conditions may lead to impacts of moderate or large significance at some sites.

All applicants are required by 10 CFR 51.53(c)(3)(ii)(J) to assess the impacts of highway traffic generated by the proposed project on the level of service of local highways during the term of the renewed license.

Since CP&L has no plans to add non-outage employees during the license renewal period, there would be no noticeable change in traffic volume and levels of service on roadways in the vicinity of the HNP site. Therefore, there would be no transportation impacts during the license renewal term and mitigation measures need not be considered.

4.4.5 Historic and Archaeological Resources

The National Historic Preservation Act (NHPA) requires Federal agencies to take into account the potential effects of their undertakings on historic properties. The historic preservation review process mandated by Section 106 of the NHPA is outlined in regulations issued by the Advisory Council on Historic Preservation in 36 CFR Part 800. Renewal of an operating license for a nuclear power plant is an undertaking that could possibly affect either known or potential historic properties that may be located at the plant. Therefore, in accordance with the provisions of the NHPA, the NRC is required to make a reasonable effort to identify historic properties in the areas of potential effects. If no historic properties are present or affected, the NRC is required to notify the State Historic Preservation Office before proceeding. If it is determined that historic properties are present, the NRC is required to assess and resolve possible adverse effects of the undertaking.

Archaeological sites, both historic and prehistoric in age, are recorded on lands associated with the HNP. In the 1970s, archaeologists conducted a survey of logging roads, farm trails, and other eroded locations in the area of the present day reservoir for the HNP (Ward 1978). That investigation documented 36 prehistoric and 1 historic site. The report concluded that the prehistoric sites were small and badly disturbed by plowing and erosion, and therefore, not significant. The one historic site was a twentieth century mill complex that was virtually destroyed. Physical traces of the mill site remain, and the report concluded that the site was not significant. By letters dated March 1978 and December 1979, the North Carolina Department of Cultural Resources concurred with the recommendations of the survey (NCDCR 1978, 1979).

The files of the North Carolina Office of State Archaeology (NCOSA) document that in the 1980s, as the reservoir was filling, avocational archaeologists recorded 13 additional sites around the reservoir. More recently, archaeologists completed a survey of approximately 70 ha (180 ac) of land where CP&L plans new construction that NRC will consider separately from the application to renew the HNP license (Patch 2006). The majority of the 70 ha (180 ac) survey area was disturbed by construction of the HNP in the 1970s; nevertheless investigators found two archaeological sites and three isolated finds. It was recommended that the sites did not meet the criteria for nomination to the National Register for Historic Places (Patch 2006).

CP&L initiated communication with the North Carolina State Historic Preservation Office (SHPO) about the re-licensing in a letter dated November 2005 (HNP 2005). The letter requested comments on the proposed relicensing and stated CP&L's conclusion that operation of HNP over the license renewal term would have no effect on any historic or archaeological properties. CP&L's letter described the HNP site itself and seven transmission corridors as within the purview of the undertaking. A response by the SHPO in January 2006 stated, "We have conducted a review of the project and are aware of no historic resource that would be affected by the project...we have no comment on the project as proposed" (NCDCR 2006).

In accordance with 36 CFR 800.8(c), the NRC contacted the North Carolina SHPO (NRC 2007c), the Advisory Council on Historic Preservation (NRC 2007d), and the appropriate Federally recognized Native American Tribes with current and historic ties to the region. These letters are presented in Appendix E.

The conditions at HNP require plans to protect archaeological sites from inadvertent disturbance or destruction. To avoid such adverse impacts, environmental review procedures have been put in place at HNP regarding undertakings that involve land disturbing construction or operational activities in undisturbed areas. CP&L has no plans to construct new facilities at HNP during the renewal term related to support license renewal (Progress Energy 2006b). However, because there is a strong potential for cultural resources to be present at the site, the applicant should take care during normal operations and maintenance activities to ensure consideration of cultural resources.

Based on the NRC staff's review of NCOSA files, archaeological reviews, surveys, assessments, and other information, the NRC staff concludes that the potential impacts of license renewal on historic and archaeological resources at HNP would be SMALL. This conclusion is based upon (1) no new ground disturbance or refurbishment activities would occur during the renewal period, and (2) the applicant understands that archaeological, historical, and other cultural resources could be present at the HNP site. Mitigation measures in the form of administrative controls are in place to ensure that, if cultural resources are found at HNP, they will be protected. The NRC staff determines that the impact of license renewal on cultural resources is SMALL. Current measures to mitigate potential impacts of plant operation on cultural resources are found to be adequate.

4.4.6 Environmental Justice

Under Executive Order 12898 (59 FR 7629), Federal agencies are responsible for identifying and addressing potential disproportionately high and adverse human health and environmental impacts on minority and low-income populations. Although the Executive Order is not mandatory for independent agencies such as the NRC, the NRC has voluntarily committed to undertake environmental justice reviews. In 2004, the Commission issued a *Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions*

(69 FR 52040), which states "The Commission is committed to the general goals set forth in E.O. 12898, and strives to meet those goals as part of its NEPA review process." (NRC 2004c)

The Council of Environmental Quality (CEQ) provides the following information in *Environmental Justice: Guidance Under the National Environmental Policy Act* (1997):

> **Disproportionately High and Adverse Human Health Effects.** Adverse health effects are measured in risks and rates that could result in latent cancer fatalities, as well as other fatal or nonfatal adverse impacts on human health. Adverse health effects may include bodily impairment, infirmity, illness, or death. Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant (as defined by NEPA [National Environmental Policy Act]) and appreciably exceeds the risk or exposure rate for the general population or for another appropriate comparison group (CEQ 1997).

> **Disproportionately High and Adverse Environmental Effects.** A disproportionately high environmental impact that is significant (as defined by NEPA) refers to an impact or risk of an impact on the natural or physical environment in a low-income or minority community that appreciably exceeds the environmental impact on the larger community. Such effects may include ecological, cultural, human health, economic, or social impacts. An adverse environmental impact is an impact that is determined to be both harmful and significant (as defined by NEPA). In assessing cultural and aesthetic environmental impacts, impacts that uniquely affect geographically dislocated or dispersed minority or low-income populations or American Indian tribes are considered (CEQ 1997).

The environmental justice analysis assesses the potential for disproportionately high and adverse human health or environmental effects on minority and low-income populations that could result from the operation of HNP during the renewal term. In assessing the impacts, the following CEQ (1997) definitions of minority individuals and populations and low-income population were used:

- <u>Minority individuals</u>. Individuals who identify themselves as members of the following population groups: Hispanic or Latino, American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, or two or more races meaning individuals who identified themselves on a Census form as being a member of two or more races, for example, Hispanic and Asian.

- <u>Minority populations</u>. Minority populations are identified when (1) the minority population of an affected area exceeds 50 percent or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

- <u>Low-income population</u>. Low-income populations in an affected area are identified with the annual statistical poverty thresholds from the Census Bureau's Current Population Reports, Series PB60, on Income and Poverty.

4.4.6.1 Minority Population in 2000

According to 2000 census data, 34 percent of the population (approximately 690,000 individuals) residing within a 50-mi radius of HNP were minority individuals. The largest minority group was Black or African American (474,000 individuals or 23 percent), followed by Hispanic or Latino (131,600 individuals or about 7 percent). About 30 percent of the Wake County population are minorities, with Black or African American the largest minority group (19.5 percent) followed by Hispanic or Latino (5.4 percent). Black or African American block groups are concentrated in urban areas (Burlington, Cary, Durham, Fayetteville, and Raleigh) and the Fort Bragg area 24 km (15 mi) from HNP. Members of the Lumbee and Tuscarora tribes are found in Hoke and Robeson counties south of the plant (Progress Energy 2006b).

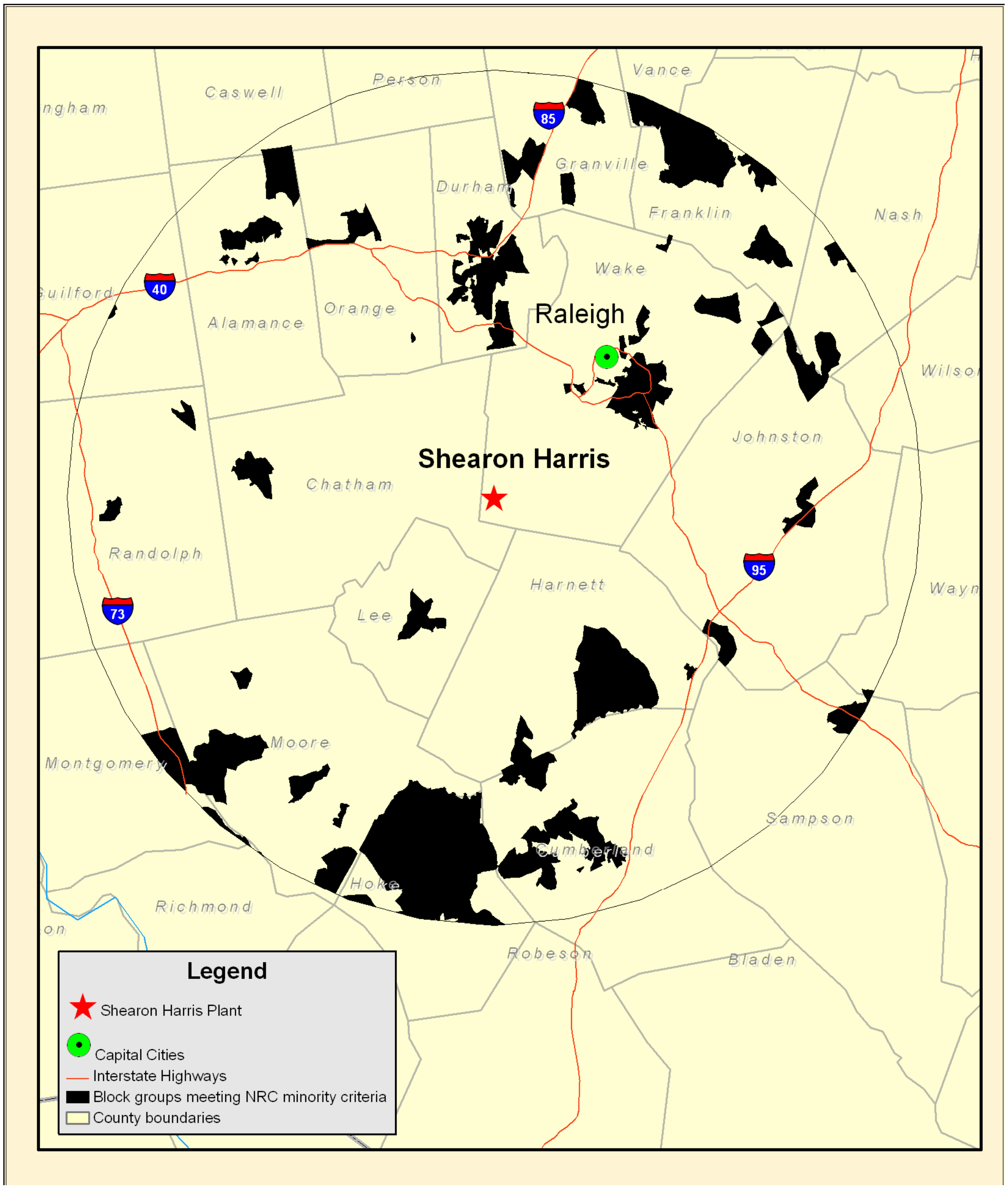
Census block groups with minority populations exceeding 50 percent were considered minority block groups. Based on 2000 census data, Figure 4–1 shows minority block groups within a 50-mi radius of HNP in which more than 50 percent of the block group population is minority.

4.4.6.2 Low-Income Population in 2000

According to 2000 census data, approximately 216,000 individuals (approximately 10 percent) residing within a 50-mi radius of HNP were identified as living below the Federal poverty threshold. The 1999 Federal poverty threshold was $17,029 for a family of four. According to 2000 census data, the median household income for North Carolina in 1999 was $39,184, while 12.3 percent of the state population was determined to be living below the 1999 Federal poverty threshold (USCB 2007).

Wake County had a higher median household income ($54,988) and a lower percentage (7.8 percent) of individuals living below the poverty level when compared to the state. Lee County had the lowest median household incomes ($38,900) and the highest percentage (12.8 percent) of individuals living below the poverty level when compared to Coffey County and the state (USCB 2007).

Census block groups were considered low-income block groups if the percentage of the population living below the Federal poverty threshold exceeded the state percentage of 12.3 percent. Based on 2000 Census data, Figure 4–2 shows low-income block groups within a 50-mi radius of HNP.

1 

2 **Figure 4–1.** Minority block groups in 2000 within an 80-km (50-mi) radius of HNP.

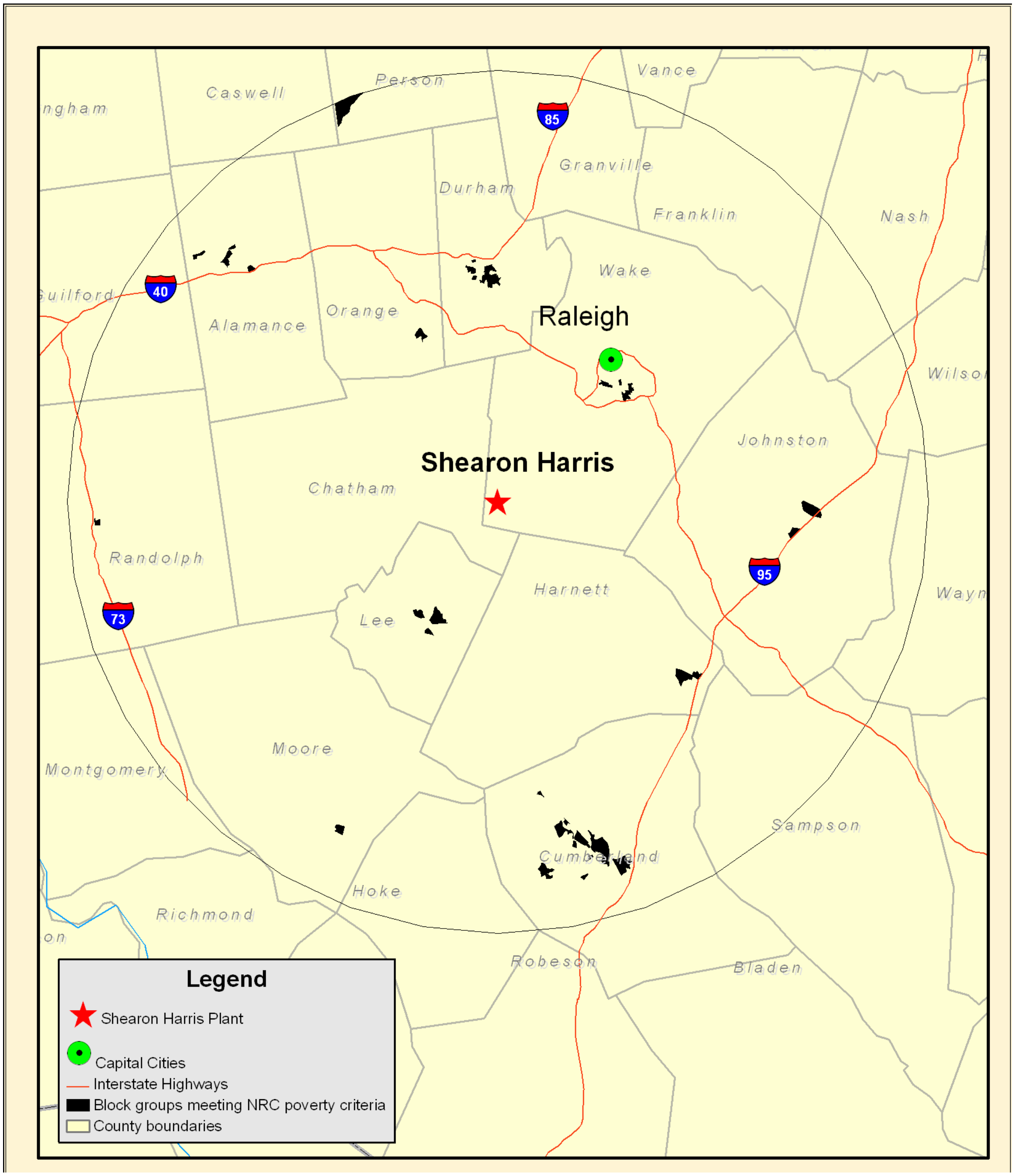


Figure 4–2. Low-income block groups with an 80-km (50-mi) radius of HNP.

4.4.6.3 Analysis of Impacts

Consistent with the impact analysis for the public and occupational health and safety, the affected populations are defined as minority and low-income populations who reside within a 50-mi radius of HNP. Based on the analysis of impacts for all resource areas presented in this draft SEIS, there would be no disproportionately high and adverse impacts from the operation of HNP during the license renewal period.

NRC also analyzed the risk of radiological exposure through the consumption patterns of special pathway receptors, including subsistence consumption of fish, native vegetation, surface waters, sediments, and local produce; absorption of contaminants in sediments through the skin; and inhalation of plant materials. The special pathway receptors analysis is important to the environmental justice analysis because consumption patterns may reflect the traditional or cultural practices of minority and low-income populations in the area.

Subsistence Consumption of Fish and Wildlife

Section 4-4 of Executive Order 12898 (1994) directs Federal agencies, whenever practical and appropriate, to collect and analyze information on the consumption patterns of populations who rely principally on fish and/or wildlife for subsistence and to communicate the risks of these consumption patterns to the public. In this draft SEIS, NRC considered whether there were any means for minority or low-income populations to be disproportionately affected by examining impacts to American Indian, Hispanic, and other traditional lifestyle special pathway receptors. Special pathways that took into account the levels of contaminants in native vegetation, crops, soils and sediments, surface water, fish, and game animals on or near the HNP site were considered.

CP&L has a comprehensive Radiological Environmental Monitoring Program (REMP) at HNP to assess the impact of site operations on the environment. Samples are collected from the aquatic and terrestrial pathways applicable to the site. The aquatic pathways include fish, surface waters and sediment. The terrestrial pathways include airborne particulates and radioiodine, milk, food products and direct radiation.

Most of the land within an 8 km (5 mi) radius of HNP is wooded with few residences and limited agricultural activity. The land in this area is primarily used for timber production. The land within a 16 km (10 mi) radius is mostly rural with significant populations centers located in the towns of Apex, Holly Springs, and Fuquay-Varina. These communities are currently experiencing significant growth. Much of the land within an 80 km (50 mi) radius is also used for agricultural crop and livestock production. Agricultural production in this region primarily consists of corn, soybeans, tobacco, cattle, hogs, poultry, and dairy (Progress Energy 2006b).

During 2005, analyses were performed on 1148 collected samples of environmental media as part of the required REMP and showed no significant or measurable radiological impact from HNP operations. Cesium-137, cobalt-58, and colbalt-60 activity was detected in samples obtained from bottom sediment and cobalt-60 activity was detected in one of three samples obtained from aquatic vegetation at Harris Reservoir. Activity due to plant operation was not evident in any shoreline sediment samples taken during 2005 and no unusual trends were noted. Tritium attributable to HNP operation was also detected in surface water samples collected from Harris Reservoir during 2005. Tritium was the only activity detected in surface water samples, except for one control sample taken upstream of the plant, and no unusual trends were noted. In the 2005 REMP, fish samples taken from Harris Reservoir were assumed to have the same amount of tritium activity as reservoir surface water (5940 pCi/liter annual average). Based on this assumption, an adult consuming 21 kg (46 lb) of fish could receive a total body and organ dose equivalent of 0.00013 mSv (0.013 mrem). No other radionuclides were detected in fish during the year. With the exception of the average tritium concentration in Harris Reservoir being higher than the 2004 annual average, the results for all samples in 2005 were consistent with the previous five-year historical results and exhibited no adverse trends (Progress Energy 2006b).

The results of the 2005 REMP demonstrate that the routine operation at the HNP site had no significant or measurable radiological impact on the environment. No elevated radiation levels were detected in the offsite environment as a result of plant operations and the storage of radioactive waste. The continued operation of the HNP has not contributed measurable radiation, with the exception of Harris Reservoir bottom sediment and aquatic vegetation, in the environmental monitoring program (Progress Energy 2006b). REMP continues to demonstrate that the dose to a member of the public from the operation of HNP remains significantly below the federally required dose limits specified in 10 CFR Part 20, 40 CFR Part 190, and 10 CFR Part 72.

Based on recent monitoring results, concentrations of contaminants in native vegetation, crops, soils and sediments, surface water, fish, and game animals in areas surrounding HNP have been quite low (at or near the threshold of detection) and seldom above background levels. Consequently, no disproportionately high and adverse human health impacts would be expected in special pathway receptor populations in the region as a result of subsistence consumption of fish and wildlife and mitigation measures need not be considered.

4.5 Groundwater Use and Quality

No Category 1 or Category 2 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, are potentially applicable to HNP groundwater use and quality during the renewal term. The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006b), the staff’s site audit, the scoping process, or its evaluation of other available information. HNP does not use groundwater for any purpose, and there is no evidence operation of the plant is contaminating groundwater in the area. While the plans have not been finalized, HNP is developing a voluntary groundwater monitoring program and plans to install more monitoring wells in the power block area too monitor for radionuclides and other parameters. However, there are no known local users of groundwater within the influence of

HNP because the local geology inhibits the development of functioning wells. Even the presence of contaminants in the HNP property would have no effect on local water supplies. Because continued operation of HNP would have no impacts on groundwater use and quality, mitigation measures need not be considered. Therefore, the NRC staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS.

4.6 Threatened or Endangered Species

Threatened or endangered species are listed as a Category 2 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. This issue is listed in Table 4-7.

Table 4-7. Category 2 Issue Applicable to Threatened or Endangered Species During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section	10 CFR 51.53(c)(3)(ii) Subparagraph	SEIS Section
THREATENED OR ENDANGERED SPECIES (FOR ALL PLANTS)			
Threatened or endangered species	4.1	E	4.6

This issue requires consultation with appropriate agencies to determine whether threatened or endangered species are present and whether they would be adversely affected by continued operation of the HNP during the license renewal term. The characteristics and habitats of threatened or endangered species in the vicinity of the HNP site are discussed in Sections 2.2.5 and 2.2.6.

CP&L contacted the FWS on November 16, 2005, regarding threatened and endangered species at the HNP site and its transmission lines ROWs (Progress Energy 2006b). In its response to CP&L, on February 16, 2006, the United States Fish and Wildlife Service (FWS) indicated that the proposed project would not likely adversely affect any Federally listed endangered or threatened species, formally designated critical habitat or any proposed species for listing under the Endangered Species Act of 1973 (Progress Energy 2006b).

On March 27, 2007, the NRC contacted the FWS and the North Carolina Natural Heritage Program to request information on Federally and State listed threatened and endangered species and critical habitats in the vicinity of HNP. The NRC staff also requested information that could assist in its assessment of the environmental impacts associated with license renewal (NRC 2007a, 2007b). In response, on April 26, 2007, the North Carolina Natural Heritage Program indicated that, “although many rare plants and animals are know to occur in North Carolina within power line ROWs apparently no such species are know to occur on the HNP power line ROWs" (North Carolina Heritage 2007). The FWS did not provided any comments in response to the March 27, 2007, NRC letter.

On June 6, 2007, NRC staff met with North Carolina Wildlife Resources Commission (NCWRC) staff to discuss potential impacts of continued operation on State-listed species. The NCWRC indicated that no habitat has been identified near the HNP site or any of its transmission line corridors. The NCWRC staff has not identified any significant foreseeable impacts on State protected species or areas that would result from continued operation or maintenance activities during the renewal term. The NRC staff contacted FWS on June 25, 2007, and concluded that the proposed project would not adversely affect Federally listed species under the FWS's jurisdiction (FWS 2007).

4.6.1 Aquatic Species

The NRC staff has reviewed information provided by the applicant, information publicly available, and has contacted the FWS and the North Carolina Department of Environment and Natural Resources (NCDENR). No Federally listed threatened or endangered aquatic species or critical habitat occurs in the Harris Reservoir, in the vicinity of the HNP site, or in the streams crossed by the transmission line ROWs. Therefore, license renewal of HNP would have no effect on any Federally listed aquatic species, therefore mitigation measures need not be considered.

4.6.2 Terrestrial Species

Two Federally listed endangered terrestrial species have been identified as occurring or historically occurring at or near the HNP site or within the associated transmission line ROWs. These are the endangered red-cockaded woodpecker (*Picoides borealis*) and the endangered Michaux's sumac (*Rhus michauxii*). These species are described in greater detail in Section 2.2.6.2.

Operation of HNP and its associated transmission lines are not expected to adversely affect any threatened or endangered terrestrial species during the license renewal term. Therefore, the NRC staff concludes that adverse impacts to threatened or endangered species during the license renewal term would be SMALL.

However, maintenance of forested areas around the HNP site likely provides habitat that could be inhabited by a threatened or endangered species during the license renewal term. Mitigation measures in the form of wildlife management plans, administrative procedures and best management practices are in place to minimize the effects of plant operation on terrestrial species. Current measures to mitigate potential impacts of plant operation on endangered terrestrial species are found to be adequate.

4.7 Evaluation of New and Potentially Significant Information on Impacts of Operations During the Renewal Term

The NRC staff has not identified new and significant information on environmental issues listed in 10 CFR Part 51, Subpart A, Appendix B, Table B-1, related to station operation during the renewal term. The NRC staff also determined that information provided during the public comment period did not identify any new issue that requires site-specific assessment. The NRC staff reviewed the discussion of environmental impacts associated with operation during the renewal term in the GEIS and has conducted its own independent review, including public scoping meetings, to identify issues with new and significant information. Processes for identification and evaluation of new information are described in Section 1.2.2.

4.8 Cumulative Impacts

The NRC staff considered potential cumulative impacts on the environment resulting from the incremental impact of license renewal when added to other past, present, and reasonably foreseeable future actions. For the purposes of this analysis, past actions are related to the resources when HNP was licensed and constructed, present actions are related to the resources during current operations, and future actions are those that are reasonably foreseeable through the end of station operations including the license renewal term. The geographic area over which past, present, and future actions are assessed is dependent on the affected resource.

The impacts of the proposed action, license renewal, as described in this chapter of the draft SEIS, are combined with other past, present, and reasonably foreseeable future actions regardless of which agency (Federal or non-Federal) or entity is undertaking the actions. The combined impacts are defined as “cumulative” in 40 CFR 1508.7 and include individually minor but collectively significant actions taking place over a period of time. It is possible that an impact that may be SMALL by itself could result in a MODERATE or LARGE impact when considered in combination with the impacts of other actions on the affected resource. Likewise, if a resource is regionally declining or imperiled, even a SMALL individual impact could be important if it contributes to or accelerates the overall resource decline.

The NRC staff has identified reasonably foreseeable actions occurring in the future that are considered in this review for its cumulative impacts on the environment. Among the identified actions, a significant one involves the submittal of an application to build two new nuclear units at the HNP site.

A letter of intent to submit a Combined License (COL) application was sent to the NRC by CP&L, in February 1, 2006[2], as amended on May 31, 2007[3]. The letter states that a COL application for the Harris site could be submitted to the NRC during the first quarter of 2008; it further indicated that the proposal calls for two Westinghouse AP 1000 units to be built at the site.

Submitting the COL application does not commit CP&L to build new nuclear units, and does not constitute approval of the proposal by the NRC. If such application is submitted, it will be evaluated on its merits and after considering and evaluating the environmental and safety implications of the proposal, the NRC will decide whether to approve or deny a license.

Should CP&L submit the application, receive approval by the NRC, and decide to construct one or two new nuclear power plant units at the HNP site the cumulative short-term construction impacts of this action could range from SMALL to LARGE in the immediate vicinity of the HNP. The cumulative long-term impacts related to the operation of the units could range from SMALL to MODERATE.

The specific cumulative impacts of the COL action will depend on the actual design, characteristics, and construction practices that could be proposed by the applicant. Such details are not available at this time, but if such application is submitted to the NRC the detailed environmental impacts of the COL action at the HNP site would be analyzed and addressed in a separate NEPA document that would be prepared by the NRC staff.

The following sections contain a description of the cumulative impacts in the vicinity of HNP. While the description might be limited due to the unavailability of specific information, the NRC staff based its assessment on scientific principles and professional judgment.

4.8.1 Cumulative Impacts on Aquatic Resources

For the purposes of this analysis, the geographic area considered for cumulative impacts on aquatic resources at HNP is the Harris Reservoir, the eight tributaries that feed into the reservoir upstream of the Harris Dam (Tom Jack Creek, Thomas Creek, Little White Oak Creek, White Oak Creek, Utley Creek, Cary Branch, Jim Branch, and Buckhorn Creek), and the section of Buckhorn Creek downstream of the Harris Dam.

As discussed in Section 4.1, the NRC staff found no new and significant information that would indicate that the conclusions regarding any of the Category 1 issues related to HNP's closed-cycle cooling system are inconsistent with the conclusions in the GEIS (NRC 1996). Because the GEIS concludes that the impacts from Category 2 issues, such as entrainment,

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2 Publicly available in ADAMS under accession number ML060460250.

3 Publicly available in ADAMS under accession number ML071550412.

impingement, and heat shock are small for closed-cycle cooling systems, operation of the HNP cooling system would not contribute significantly to the cumulative impacts for surface water quality and aquatic resources of Harris Reservoir and its tributaries.

The current and future conditions of local aquatic resources water quality are influenced by the cumulative effects of past actions. Section 2.2.5 discusses the major changes and modifications within Harris Reservoir and its immediate drainage area that have had the greatest impacts on aquatic resources. These changes include the damming of Buckhorn Creek to create Harris Reservoir and fluctuations in nutrient levels due to discharges from HNP, the Harris Energy & Environment Center, and Holly Spring's Utley Creek Wastewater Treatment Plant (WWTP). Since the mid-1990s, nutrient levels in the Harris Reservoir have stabilized to eutrophic condition. Additionally, recreational fishing pressure, as well as the introduction of species by the North Carolina Wildlife Resources Commission in 1987, have likely altered the ecosystem of the Harris Reservoir. Threadfin shad (*Dorosoma petenense*) was introduced to provide prey for largemouth bass (*Micropterus salmoides*), a relationship that led to a productive recreational fishery. Common carp (*Cyprinus carpio*) was introduced to the auxiliary reservoir to control the spread of nuisance vegetation.

Recreational fishing pressure is likely to continue to affect aquatic resources in the Harris Reservoir and associated waterways. Despite the slot limit for largemouth bass instituted by North Carolina Wildlife Resources Commission, fishing pressure is high, and creel surveys reveal that the reservoir is often crowded with bass fishermen (Jones et al. 2000), especially during tournaments. Boating, waterskiing, and other related activities on the reservoir can introduce pollutants to the water system, as can runoff from US Route 1 (from Apex to New Hill). Water activities can also lead to increased rates of shoreline erosion.

The construction of the Harris Dam flooded the creeks that now feed into the reservoir, changing the immediate area. However, streamflow for the downstream sections of Buckhorn Creek did not change dramatically. CP&L is currently assessing if any bathymetric changes have occurred due to sedimentation in the reservoir, but they currently have no plans to dredge Harris Reservoir.

The Utley Creek WWTP discharges into Utley Creek, a tributary of White Oak Creek, which flows into the Harris Reservoir. The town of Holly Spring plans to expand the WWTP and to send treated effluent to the Western Wake Water Reclamation Facility when it becomes operational. The new water reclamation facility would discharge into the Cape Fear River below the Buckhorn Dam (at the intersection of the Cape Fear River and Buckhorn Creek). According to NCDENR, this plan would improve water quality in Utley Creek and downstream waters. (NCDENR 2007).

Several brick companies, including Triangle Brick and Cherokee Brick, which are located in the area of HNP, consume water from the surrounding area in their production of brick.

Additionally, local agriculture can have impacts on both the consumption and pollution of the area's aquatic resources.

Hydrilla (*Hydrilla verticillata*) and creeping water primrose (*Ludwigia grandiflora*), two invasive aquatic plants, have been growing in Harris Reservoir and are likely to continue to affect the area. With the exception of the introduction of common carp to the auxiliary reservoir, nothing has been done to check the spread of these species, in part because they provide habitat for largemouth bass and other fish. CP&L discovered the presence of the invasive plant species water hyacinth (*Eichohornia crassipes*) and water lettuce (*Pistia stratiotes*) and removed the two species in 2002. Although these species have not been rediscovered, they, or other invasive species, could establish populations in the future.

The largest change that is reasonably foreseeable for the area is the possible creation and operation of two additional nuclear units at HNP by CP&L, as indicated in the letter of intent to NRC (Progress Energy 2005b, 2007c). If the units are built, HNP would require additional water for the two new cooling towers. This would require the reservoir level to be raised an estimated 6 m (20 ft), which would approximately double the acreage of the reservoir. This could lead to an increase in eutrophy in the reservoir. Additionally, HNP would withdraw makeup water from the Cape Fear River, potentially affecting that resource, which currently serves as the water source for the Cape Fear Plant, also owned by CP&L. Evaporation and blowdown levels would increase, and the increased footprint of the new units could lead to additional runoff to the reservoir and streams. A decrease in distance from agricultural areas could increase agricultural runoff, which could affect aquatic species. As an example of how runoff can affect aquatic resources, after Hurricane Fran in September 1996, the large-scale flooding caused excess runoff that carried plant nutrients and organic material into the upper Thomas Creek area of Harris Reservoir, resulting in low dissolved oxygen concentrations that killed an estimated 10,000 fish (CP&L 1996, 1997). If the reservoir is indeed raised by 6 m (20 ft), transmission line towers located in or near the reservoir would likely be rebuilt. The associated construction would affect aquatic resources. A complete review of the impacts from two new units would be included in future environmental impact statements (EISs) if CP&L proceeds with its application.

The NRC staff concludes that the minimal aquatic impacts of the continued HNP operations would not contribute to an overall decline in the condition of aquatic resources. However, the impacts of other current and future actions, by CP&L or other entities, could have significant impacts to the aquatic resources, and therefore, the potential cumulative impacts on the Harris Reservoir and associated waterways would be MODERATE to LARGE. Mitigative measures for the potential future actions by CP&L would be addressed in future EISs, if applicable.

4.8.2 Cumulative Impacts on Terrestrial Resources

This section addresses past, present, and future actions that could result in adverse cumulative impacts on terrestrial resources, including wildlife populations, upland habitats, wetlands, riparian zones, invasive species, protected species, and land use. For purposes of this analysis, the geographic area considered in the evaluation includes the HNP site, the Harris Research Tract, the Shearon Harris Game Lands, the Harris Lake State Park, all forested land owned by CP&L and managed for timber production, the ROWs of the seven in-scope transmission lines identified in Section 2.1.7, the wetlands on and in the vicinity of the HNP site, and the significant natural heritage areas of Wake County discussed in Section 2.2.6.1.

Initial construction of the HNP site converted approximately 400 ha (1000 ac) of forested land owned by CP&L into cleared land used for industrial purposes, though the majority of the 2000 to 2500 ha (5000 to 6000 ac) was left undeveloped and is now managed to ensure forest growth continues (Progress Energy 2006b). During construction, the Harris Reservoir was formed from the creation of a dam on Buckhorn Creek for the purpose of creating a water supply for HNP. Creation of the Harris Reservoir submerged many acres of forested land. Leveling of the land surrounding Harris Reservoir created suitable land for wetland vegetation, and allowed lowland forest vegetation to develop.

Construction of the seven transmission lines maintained by CP&L for HNP resulted in subsequent changes to the wildlife and plant species present within the vicinity of HNP. Due to the fragmentation of previously contiguous forested areas, edge effects such as changes in light, wind, and temperature, changes in abundance and distribution of interior species, reduced habitat ranges for certain species, and an increased susceptibility to invasive species have likely occurred in these areas. ROW maintenance has likely had past impacts and is likely to have present and future impacts on the terrestrial habitat, which may include bioaccumulation of chemicals, prevention of the natural successional stages of the surrounding vegetative community due to mowing and cutting, an increase in abundance of edge species, a decrease in abundance of interior species, and an increase in invasive species populations.

Invasive terrestrial species are not managed by CP&L on their land holdings; therefore, a potential exists for invasive species to be introduced on or in the vicinity of the HNP site from present and future actions. Introduction may contribute to the establishment of an invasive species population, which could compete with native populations for resources and degrade areas of terrestrial habitat.

Protected species within the vicinity of HNP, which are discussed in Section 2.2.6, are expected to continue to inhabit the area. Management of the Harris Research Tract would ensure the existence of the longleaf pine as well as any threatened and endangered species contained within this area of land. Hunting is permitted on the Shearon Harris Game Lands; however, the FWS, in conjunction with other Federal and State agencies, prohibits hunting of all protected species and species of special concern. Population depletion does not pose a foreseeable threat to any terrestrial species within the Shearon Harris Game Lands.

The Cape Fear Plant near Moncure, North Carolina, is located within 16 km (10 mi) of the HNP site and has two coal-fired units, four oil-fired units, and two combined-cycle generating units

(Progress Energy 2007b). Fossil plants release carbon dioxide, mercury, nitrous oxides, and sulfur dioxide, among other air emissions. Nitrous oxides and sulfur dioxides can combine with water to form acid rain, which can lead to erosion and changes in soil pH levels. Mercury can deposit on soils and surface water, which may then be taken up by both terrestrial and aquatic plant or animal species, and poses the risk of bioaccumulation. For these reasons, the Cape Fear Plant is likely to have current and future impacts to the environment on the HNP site and surrounding area.

Utley Creek Wastewater Treatment Plant is located on Utley Creek, a creek that flows into the Harris Reservoir (NCDENR 2007). Chemical discharges from this wastewater treatment plant that enter Utley Creek and then flow into Harris Reservoir may have current and future impacts on the surrounding vegetation, wetlands, and wildlife. Bioaccumulation of chemicals throughout the terrestrial environment also poses a threat to these habitats, as well as to riparian zones and wildlife species.

Prior and continued development of Wake County for residential and industrial purposes may affect the terrestrial habitat within in the vicinity of the HNP site. Significant increases in both commercial and residential development have occurred in Wake County over the past 20 years. With future development, additional runoff from roads and impervious surfaces, development adjacent to wetlands and riparian zones, and an increase in waste releases could have future impacts on the terrestrial habitat.

CP&L intends to apply for combined licenses for two new reactor units in 2008, which would be located on previously disturbed land adjacent to the current unit (Progress Energy 2005b; 2007c). The operation of the new units would require CP&L to raise the level of Harris Reservoir by 6 m (20 ft). The increase in the depth of the reservoir would submerge many acres of terrestrial habitat, including wetlands, riparian zones, and lowland forest areas; however, CP&L would likely mitigate the loss of these habitats by creating new areas of wetland vegetation. Other lowland terrestrial habitat would be lost. The Harris Lake County Park may need to be relocated due the rise of Harris Reservoir, and two boat ramps would need to be moved. Additionally, the rise in Harris Reservoir would necessitate the relocation of a highway and the raising of a road and bridge. Therefore, the increase in depth of Harris Reservoir would have future effects on the terrestrial environment.

Though new transmission lines may need to be added to HNP, CP&L does not anticipate the need for additional ROWs with the addition of two new units. However, some transmission line towers in or near Harris Reservoir would need to be elevated due to the increase in depth of the reservoir. No additional impacts are likely from transmission lines than those discussed above concerning ROW maintenance.

The NRC staff believes that the cumulative impacts during the term of license renewal on terrestrial habitat and associated species, when added to past, present, and reasonably foreseeable future actions, would be MODERATE to LARGE. Mitigative measures for the potential future actions by CP&L would be addressed in future EISs, if applicable.

4.8.3 Cumulative Impacts on Groundwater Use and Quality

HNP does not use groundwater for any purpose. All of the water supply comes from either Harris Reservoir or the auxiliary reservoir. In addition, there are no local wells down-gradient of HNP that would be affected by plant operations, and no local public water supply uses groundwater as a source. Future planned groundwater monitoring should determine if radionuclides are present in the groundwater in the power block area. Because the general direction of groundwater flow is toward the reservoir and water from the site does not reach any known aquifer, no groundwater contamination, if it exists, would reach beyond the HNP property.

The two reservoirs were created to serve as the entire water source for HNP and had a measurable impact on local hydrologic conditions when built. Small perennial and intermittent streams were converted to limnological conditions with the resulting increase in groundwater bank storage and area groundwater levels. The effect on groundwater use was negligible because the local aquifer is not capable of producing more than 3 to 76 liters per minute (1 to 20 gallons per minute). The increase in water levels may have improved the prospect of developing local wells.

There are future plans to build two new power reactor units at HNP. Both of these would likely use closed-cycle cooling towers and would use the Harris Reservoir and auxiliary reservoir as water supplies. The initial planning indicates the reservoirs would be raised about 6 m (20 ft) from current maintained elevations to provide the needed water supply. This would have an impact on groundwater levels near the reservoir, but the impact has not been evaluated. It is likely local groundwater recharge would increase with enlargement of the reservoirs. Continued use of the Harris Reservoir and auxiliary reservoir at HNP, even at higher volumes, would result in SMALL adverse cumulative impacts to groundwater use and quality. Mitigative measures for the potential future actions by CP&L would be addressed in future EISs, if applicable.

4.8.4 Cumulative Impacts on Surface Water

Because HNP uses a cooling tower and does not discharge into a small river, CP&L is not required to monitor the thermal discharge for potential impacts to public health from thermophilic microorganisms. However, in the future and under certain conditions, localized areas of Harris Reservoir at the discharge could potentially increase in temperature, creating an environment optimal for the growth of thermophilic microorganisms such as the enteric pathogens *Salmonella* spp. and *Shigella* spp., the bacterium *Pseudomonas aeruginos*, thermophilic fungi, bacteria *Legionella* spp., and pathogenic strains of the free-living amoebae *Naegleria* spp. and *Acanthamoeba* spp.

The development of the reservoirs during construction of HNP changed the local surface water regime from small perennial and intermittent streams to limnological conditions. This was a significant change in local hydrologic conditions, but there is no evidence the impact was adverse. The reservoirs have value as recreational venues, wildlife habitat, and limited flood-control structures.

Another significant change to the newly established hydrologic regime would likely be caused by the proposed future increase in reservoir water levels by 6 m (20 ft). This change has not been evaluated, but water quality may deteriorate at first flooding as increased sediment load and bioacculmulation at the reservoir bottom could occur. Erosion control measures could be used to mitigate increased turbidity and sedimentation and clear-cutting of potentially flooded vegetation may be considered. Studies have not been initiated, but the impact to surface water in the area from a 6 m (20 ft) increase in water levels would likely be MODERATE. Mitigative measures for the potential future actions by CP&L would be addressed in future EISs, if applicable.

4.8.5 Cumulative Radiological Impacts

Operation of HNP results in the release of radioactive material into the environment, which results in a very small increase in radiation dose to the local population from that received from background radiation. Continued operation of HNP for the license renewal term would result in irreversible and irretrievable resource commitments, including the following:

- nuclear fuel, which is used in the reactor and is converted to radioactive waste;
- land required to dispose of spent nuclear fuel and low-level radioactive wastes generated as a result of plant operations, and sanitary wastes generated from industrial operations;
- elemental materials that become radioactive; and
- materials used for the industrial operations of the plant that cannot be recovered or recycled or that are consumed or reduced to unrecoverable forms.

Radiation protections standards for protection of the public and workers have been developed by the EPA and NRC to minimize the cumulative impact of acute and long-term exposure to radiation and radioactive material. These radiation standards are codified in 40 CFR Part 190 and 10 CFR Part 20, and contain the upper limits of allowable radiation exposure from the existing two reactors at HNP, as well as the proposed two additional reactors. For the purpose of this analysis, the area within a 50-mi radius of the HNP site was included. The REMP conducted by CP&L in the vicinity of the HNP site measures radiation and radioactive material from all sources, including HNP; therefore, the monitoring program is appropriate to measure cumulative radiological impacts. There are four other nuclear power reactors in North Carolina: two at the Brunswick plant and two at the McGuire plant. However, none of those plants are within a 50-mi radius of HNP. Out-of-state nuclear power plants are located beyond 50 miles from HNP. The annual radiological environmental monitoring operating reports for the 5-year period from 2002 to 2006 were reviewed as part of the cumulative impacts assessment (Progress Energy 2003a, 2004a; 2005a; 2006d; 2007a). No radiation levels in excess of regulatory standards were reported. Additionally, in Sections 2.2.7 and 4.3, the NRC staff presented information which supports that the radiological impacts to the public and workers from operation of HNP during the renewal term as SMALL. The NRC and the State of North Carolina would regulate any future activities in the vicinity of the HNP site that could contribute to cumulative radiological impacts.

Therefore, the staff concludes that cumulative radiological impacts of continued operation of HNP are SMALL. NRC and the State of North Carolina will continue to regulate future activities of the HNP for radiological impacts.

4.8.6 Cumulative Socioeconomic Impacts

As discussed in Section 4.4, the continued operation of HNP during the license renewal term would have no impact on socioeconomic conditions in the region beyond those already being experienced. Since CP&L has indicated that there would be no major plant refurbishment, overall expenditures and employment levels at HNP would remain relatively constant with no additional demand for housing, public utilities, and public services. In addition, since employment levels and the value of HNP would not change, there would be no population- and tax revenue-related land use impacts. There would also be no disproportionately high or adverse health or environmental impacts on minority and low-income populations in the region. Based on this and other information presented in the draft SEIS, there would be no cumulative socioeconomic impacts from HNP operations during the license renewal term and mitigation measures need not be considered.

If CP&L decides to construct one or two new nuclear power plant units at the HNP site, the cumulative short-term construction impacts of this action would be MODERATE to LARGE in the immediate vicinity of HNP. These impacts would be caused by the short-term increased demand for rental housing and other commercial and public services by construction workers during the years of plant construction. During peak construction periods there would be a noticeable increase in the number and volume of construction vehicles on roads in the immediate vicinity of the HNP site.

The cumulative long-term operations impacts of this action during the operation of the new power plant unit(s) would be SMALL to MODERATE. These impacts would be caused by the increased demand for permanent housing and other commercial and public services, such as schools, police and fire, and public water and electric services by operations workers during the years of plant operations. During shift changes there would be a noticeable increase in the number of commuter vehicles on roads in the immediate vicinity of the HNP site.

Because Wake County is one of the fastest growing counties in the nation, the cumulative socioeconomic construction and operations impacts are likely to be SMALL when combined with all of the other ongoing public and commercial development projects in the county and region. For the reasonably foreseeable future, members of the public would continue to experience the cumulative socioeconomic impacts from the rapid development of Wake County. If CP&L constructs these new nuclear power plant units at the HNP site, the cumulative impacts of this action would likely be SMALL.

The specific impact of this action will depend on the actual design, characteristics, and construction practices that could be proposed by the applicant. Such details are not available at this time, but if such application is submitted to NRC the detailed socioeconomic impacts of this action at the HNP site would be analyzed and addressed in a separate NEPA document that would be prepared by NRC.

4.9 Summary of Impacts of Operations During the Renewal Term

The NRC staff has not identified any information that is both new and significant related to any of the applicable Category 1 issues associated with the HNP operation during the renewal term. Consequently, the NRC staff concludes that environmental impacts associated with these issues are bounded by the impacts described in the GEIS. For each of these issues, the GEIS concluded that the impacts would be SMALL and that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

Plant-specific environmental evaluations were conducted for eight Category 2 issues applicable to HNP operation during the renewal term and for environmental justice and chronic effects of electromagnetic fields. For four issues (Housing, Public Utilities, Offsite Land Use, Transportation), the NRC staff concludes that there are no environmental impacts during the license renewal term. For the remaining four issues (Acute Effects-Electromagnetic Fields, Historic and Archaeological Resources, Threatened or Endangered Species, Severe Accidents), the NRC staff concluded that the potential environmental impacts of renewal term operations of HNP would be of SMALL significance in the context of the standards set forth in the GEIS.

For the issue of environmental justice the NRC staff determined that no disproportionately high and adverse impacts would be expected on minority and low income populations. In addition, the NRC staff determined that a consensus has not been reached by appropriate Federal health agencies regarding chronic adverse effects from electromagnetic fields. Therefore, the NRC staff did not conduct an evaluation of this issue.

4.10 References

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10 CFR Part 72. *Code of Federal Regulations*, Title 10, *Energy,* Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste."

36 CFR Part 800. *Code of Federal Regulations*, Title 36, *Parks, Forests, and Public Property,* Part 800, "Protection of Historic Properties."

40 CFR Part 190. *Code of Federal Regulations*, Title 40, *Protection of Environment*, Part 190, "Environmental Radiation Protection Requirements for Normal Operations of Activities in the Uranium Fuel Cycle."

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5.0 ENVIRONMENTAL IMPACTS OF POSTULATED ACCIDENTS

Environmental issues associated with postulated accidents are discussed in the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996, 1999).(1) The GEIS includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective off-site radiological impacts from the fuel cycle and from high-level waste [HLW] and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1, and therefore, additional plant-specific review of these issues is required.

This chapter describes the environmental impacts from postulated accidents that might occur during the license renewal term.

5.1 Postulated Plant Accidents

Two classes of accidents are evaluated in the GEIS. These are design-basis accidents (DBAs) and severe accidents, as discussed below.

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(1)The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the “GEIS” include the GEIS and Addendum 1.

5.1.1 Design-Basis Accidents

In order to receive U.S. Nuclear Regulatory Commission (NRC) approval to operate a nuclear power facility, an applicant for an initial operating license (OL) must submit a Safety Analysis Report (SAR) as part of its application. The SAR presents the design criteria and design information for the proposed reactor and comprehensive data on the proposed site. The SAR also discusses various hypothetical accident situations and the safety features that are provided to prevent and mitigate accidents. The NRC staff reviews the application to determine whether the plant design meets the Commission's regulations and requirements and includes, in part, the nuclear plant design and its anticipated response to an accident.

Design-basis accidents (DBAs) are those accidents that both the licensee and the NRC staff evaluate to ensure that the plant can withstand normal and abnormal transients, and a broad spectrum of postulated accidents, without undue hazard to the health and safety of the public. A number of these postulated accidents are not expected to occur during the life of the plant, but are evaluated to establish the design basis for the preventive and mitigative safety systems of the facility. The acceptance criteria for DBAs are described in Title 10, Part 50 and Part 100, of the Code of Federal Regulations (10 CFR Part 50 and 10 CFR Part 100).

The environmental impacts of DBAs are evaluated during the initial licensing process, and the ability of the plant to withstand these accidents is demonstrated to be acceptable before issuance of the OL. The results of these evaluations are found in license documentation such as the applicant's Final Safety Analysis Report (FSAR), the NRC staff's Safety Evaluation Report (SER), the Final Environmental Statement (FES), and Section 5.1 of this Supplemental Environmental Impact Statement (SEIS). A licensee is required to maintain the acceptable design and performance criteria throughout the life of the plant, including any extended-life operation. The consequences for these events are evaluated for the hypothetical maximally exposed individual; as such, changes in the plant environment will not affect these evaluations. Because of the requirements that continuous acceptability of the consequences and aging management programs be in effect for license renewal, the environmental impacts as calculated for DBAs should not differ significantly from initial licensing assessments over the life of the plant, including the license renewal period. Accordingly, the design of the plant relative to DBAs during the extended period is considered to remain acceptable, and the environmental impacts of those accidents were not examined further in the GEIS.

The Commission has determined that the environmental impacts of DBAs are of SMALL significance for all plants because the plants were designed to successfully withstand these accidents. Therefore, for the purposes of license renewal, DBAs are designated as a Category 1 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. The early resolution of the DBAs makes them a part of the current licensing basis of the plant; the current licensing basis of the plant is to be maintained by the licensee under its current license and, therefore, under the provisions of 10 CFR 54.30, is not subject to review under license renewal. This issue, applicable to Shearon Harris Nuclear Power Plant, Unit 1 (HNP), is listed in Table 5-1.

Table 5-1. Category 1 Issues Applicable to Postulated Accidents During the Renewal Term

ISSUE—10 CFR PART 51, SUBPART A, APPENDIX B, TABLE B-1	GEIS SECTION
POSTULATED ACCIDENTS	
Design basis accidents	5.3.2; 5.5.1

Based on information in the GEIS, the Commission found that

> The NRC staff has concluded that the environmental impacts of design-basis accidents are of small significance for all plants.

Carolina Power & Light Company, doing business as Progress Energy Carolinas, Inc. (CP&L), stated in its Environmental Report (ER) (Progress Energy 2006) that it is not aware of any new and significant information associated with the renewal of the HNP OL. The NRC staff has not identified any new and significant information during its independent review of the CP&L ER, the site visit, the scoping process, or the evaluation of other available information. Therefore, the NRC staff concludes that there are no impacts related to DBAs beyond those discussed in the GEIS.

5.1.2 Severe Accidents

Severe nuclear accidents are those that are more severe than DBAs because they could result in substantial damage to the reactor core, regardless of offsite consequences. In the GEIS, the NRC staff assessed the impacts of severe accidents using the results of existing analyses and site-specific information to conservatively predict the environmental impacts of severe accidents for each plant during the renewal period.

Severe accidents initiated by external phenomena, such as tornadoes, floods, earthquakes, fires, and sabotage, traditionally have not been discussed in quantitative terms in FESs and were not specifically considered for the HNP site in the GEIS (NRC 1996). However, in the GEIS, the NRC staff did evaluate existing impact assessments performed by the NRC and by the industry at 44 nuclear plants in the United States and concluded that the risk from beyond-design-basis earthquakes at existing nuclear power plants is SMALL. Additionally, compliance with the NRC regulatory requirements under 10 CFR Part 73 provide reasonable assurance that the risk from sabotage is SMALL. Even if such events were to occur, the Commission would expect that resultant core damage and radiological releases would be no worse than those expected from internally initiated events. Based on the above, the Commission concludes that the risk from sabotage and beyond design-basis earthquakes at existing nuclear power plants is small and additionally, that the risks from other external events, are adequately addressed by a generic consideration of internally initiated severe accidents.

Based on information in the GEIS, the Commission found that

> The probability weighted consequences of atmospheric releases, fallout onto open bodies of water, releases to groundwater, and societal and economic impacts from severe accidents are small for all plants. However, alternatives to mitigate severe accidents must be considered for all plants that have not considered such alternatives.

Therefore, the Commission has designated mitigation of severe accidents as a Category 2 issue in 10 CFR Part 51, Subpart A, Appendix B, Table B-1. This issue, applicable to HNP, is listed in Table 5-2.

Table 5-2. Category 1 Issues Applicable to Postulated Accidents During the Renewal Term

ISSUE—10 CFR PART 51, SUBPART A, APPENDIX B, TABLE B-1	GEIS SECTION	10 CFR 51.53(C)(3)(II) SUBPARAGRAPH	SEIS SECTION
POSTULATED ACCIDENTS			
Severe Accidents	5.3.3; 5.3.3.2; 5.3.3.3; 5.3.3.4; 5.3.3.5; 5.4; 5.5.2	L	5.2

5.2 Severe Accident Mitigation Alternatives

Section 51.53(c)(3)(ii)(L) requires that license renewal applicants consider alternatives to mitigate severe accidents if the staff has not previously evaluated SAMAs for the applicant's plant in an environmental impact statement (EIS) or related supplement or in an environmental assessment. The purpose of this consideration is to ensure that plant changes (i.e., hardware, procedures, and training) with the potential for improving severe accident safety performance are identified and evaluated. SAMAs have not been previously considered for Shearon Harris Nuclear Plant (HNP); therefore, the remainder of Chapter 5 addresses those alternatives.

5.2.1 Introduction

This section presents a summary of the SAMA evaluation for HNP conducted by Carolina Power and Light (CP&L) and the NRC staff's review of that evaluation. The NRC staff performed its review with contract assistance from Information Systems Laboratories, Inc. The NRC staff’s review is available in full in Appendix G; the SAMA evaluation is available in full in CP&L’s ER.

The SAMA evaluation for HNP was conducted with a four-step approach. In the first step CP&L quantified the level of risk associated with potential reactor accidents using the plant-specific probabilistic safety assessment (PSA) and other risk models.

In the second step CP&L examined the major risk contributors and identified possible ways (SAMAs) of reducing that risk. Common ways of reducing risk are changes to components, systems, procedures, and training. CP&L initially identified 22 potential SAMAs for HNP. CP&L screened out two SAMAs from further consideration because they were determined to not be applicable to the HNP design or to have estimated costs that would exceed the dollar value associated with completely eliminating all severe accident risk at HNP. The remaining 20 SAMAs were subjected to further evaluation.

In the third step CP&L estimated the benefits and the costs associated with each of the remaining SAMAs. Estimates were made of how much each SAMA could reduce risk. Those estimates were developed in terms of dollars in accordance with NRC guidance for performing regulatory analyses (NRC 1997). The cost of implementing the proposed SAMAs was also estimated.

Finally, in the fourth step, the costs and benefits of each of the remaining SAMAs were compared to determine whether the SAMA was cost-beneficial, meaning the benefits of the SAMA were greater than the cost (a positive cost-benefit). CP&L found one SAMA to be potentially cost-beneficial in the baseline analysis, and two additional SAMAs to be potentially cost-beneficial when analysis uncertainties are considered (Progress Energy 2006).

The potentially cost-beneficial SAMAs do not relate to adequately managing the effects of aging during the period of extended operation; therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54. CP&L's SAMA analyses and the NRC's review are discussed in more detail below.

5.2.2 Estimate of Risk

CP&L submitted an assessment of SAMAs for HNP as part of the ER (Progress Energy 2006). This assessment was based on the most recent HNP PSA available at that time, a plant-specific offsite consequence analysis performed using the MELCOR Accident Consequence Code System 2 (MACCS2) computer program, and insights from the HNP Individual Plant Examination (IPE) (CP&L 1993) and Individual Plant Examination of External Events (IPEEE) (CP&L 1995).

The baseline core damage frequency (CDF) for the purpose of the SAMA evaluation is approximately 9.2 x 10-6 per year. This CDF is based on the risk assessment for internally-initiated events. CP&L did not include the contribution to risk from external events within the HNP risk estimates; however, it did account for the potential risk reduction benefits associated with external events by increasing the estimated benefits for internal events by a factor of two. The breakdown of CDF by initiating event is provided in Table 5-3.

Table 5-3. HNP Core Damage Frequency

Initiating Event	CDF(Per Year)	Percent Contribution to CDF
Loss of Offsite Power	2.8 x 10-6	30
Internal Floods	1.6 x 10-6	17
LOCA	1.3 x 10-6	14
Loss of AC Bus	9.2 x 10-7	10
Steam Generator Tube Rupture	8.3 x 10-7	9
Reactor Trip	4.6 x 10-7	5
Loss of Feedwater	4.6 x 10-7	5
Loss of Instrument Air	3.7 x 10-7	4
Spurious ESFAS	2.8 x 10-7	3
Interfacing System LOCA	1.9 x 10-7	2
Other	9.2 x 10-8	1
Total CDF (internal events)	**9.24 x 10-6**	**100**

As shown in Table 5-3, events initiated by loss of offsite power (LOOP) and internal flooding are the dominant contributors to CDF. Although not separately reported, station blackout (SBO) sequences contribute roughly 2.2 x 10-6 per year (24 percent of the total internal events CDF), while anticipated transient without scram (ATWS) sequences contribute 2.3 x 10-7 per year (about 2 percent of the total internal events CDF).

CP&L estimated the dose to the population within 80 km (50 mi) of the HNP site to be approximately 0.29 person-Sv (29 person-rem) per year. The breakdown of the total population dose by containment release mode is summarized in Table 5-4. Containment bypass failures such as a steam generator tube rupture (SGTR) accident with a stuck open safety relief valve (SRV) on the ruptured steam generator or an unmitigated interfacing-systems loss of coolant accident (ISLOCA) dominate the contributions to the population dose risk at HNP.

Table 5-4. Breakdown of Population Dose by Containment Release Mode

Containment Release Mode	**Population Dose (Person-Rem[1] Per Year)**	**Percent Contribution**
Containment Intact	0	0
Late Containment Failure without scrubbing	0.9	3
Large Early Containment Failure without scrubbing	0.1	0
Small Containment Bypass (SGTR or mitigated inter-system LOCA) with scrubbing	0.4	1
Large Containment Bypass (SGTR with stuck open SRV, ruptured SG or unmitigated ISLOCA) with scrubbing	5.4	19
Large Containment Bypass (SGTR with stuck open SRV, ruptured SG or unmitigated ISLOCA) without scrubbing	19.9	69
Very Late Containment Failure (basemat melt through)	0.2	1
Very Late Containment Failure (over pressurization)	1.9	7
Total	**29**	**100**

[1] One person-Rem = 0.01 person-Sv

The NRC staff has reviewed CP&L's data and evaluation methods and concludes that the quality of the risk analyses is adequate to support an assessment of the risk reduction potential for candidate SAMAs. Accordingly, the staff based its assessment of offsite risk on the CDFs and offsite doses reported by CP&L.

5.2.3 Potential Plant improvements

Once the dominant contributors to plant risk were identified, CP&L searched for ways to reduce that risk. In identifying and evaluating potential SAMAs, CP&L considered insights from the plant-specific PSA, and SAMA analyses performed for other operating plants that have submitted license renewal applications. CP&L identified 22 potential risk-reducing improvements (SAMAs) to plant components, systems, procedures and training.

CP&L removed two SAMAs from further consideration because they were determined to not be applicable to the HNP design or to have estimated costs that would exceed the dollar value associated with completely eliminating all severe accident risk at HNP. A detailed cost-benefit analysis was performed for each of the 20 remaining SAMAs.

The staff concludes that CP&L used a systematic and comprehensive process for identifying potential plant improvements for HNP, and that the set of potential plant improvements identified by CP&L is reasonably comprehensive and, therefore, acceptable.

5.2.4 Evaluation of Risk Reduction and Costs of Improvements

CP&L evaluated the risk-reduction potential of the remaining 20 SAMAs. The SAMA evaluations were performed using realistic assumptions with some conservatism.

CP&L estimated the costs of implementing the 20 candidate SAMAs through the application of engineering judgment, and use of other licensees' estimates for similar improvements. The cost estimates conservatively did not include the cost of replacement power during extended outages required to implement the modifications, nor did they include contingency costs associated with unforeseen implementation obstacles.

The staff reviewed CP&L's bases for calculating the risk reduction for the various plant improvements and concludes that the rationale and assumptions for estimating risk reduction are reasonable and generally conservative (i.e., the estimated risk reduction is similar to or somewhat higher than what would actually be realized). Accordingly, the staff based its estimates of averted risk for the various SAMAs on CP&L's risk reduction estimates.

The staff reviewed the bases for the applicant's cost estimates. For certain improvements, the staff also compared the cost estimates to estimates developed elsewhere for similar improvements, including estimates developed as part of other licensees' analyses of SAMAs for operating reactors and advanced light-water reactors. The staff found the cost estimates to be consistent with estimates provided in support of other plants' analyses.

The staff concludes that the risk reduction and the cost estimates provided by CP&L are sufficient and appropriate for use in the SAMA evaluation.

5.2.5 Cost-Benefit Comparison

The cost-benefit analysis performed by CP&L was based primarily on NUREG/BR-0184 (NRC 1997) and was executed consistent with this guidance. NUREG/BR-0058 has recently been revised to reflect the agency's revised policy on discount rates. Revision 4 of NUREG/BR-0058 states that two sets of estimates should be developed – one at three percent and one at seven percent (NRC 2004). CP&L provided both sets of estimates (Progress Energy 2006).

CP&L identified one potentially cost-beneficial SAMA in the baseline analysis contained in the ER (using a three percent discount rate). The potentially cost-beneficial SAMAs is:

> SAMA 9 - Proceduralize actions to open emergency diesel generator (EDG) room doors and implement portable fans on loss of heating ventilation and air-conditioning (HVAC).

CP&L performed additional analyses to evaluate the impact of parameter choices and uncertainties on the results of the SAMA assessment (Progress Energy 2006). If the benefits are increased by a factor of 1.5 to account for uncertainties, two additional SAMA candidates were determined to be potentially cost-beneficial:

> SAMA 6 - Waterproof motor operators for valves 1SW-274 and 1SW-275 to mitigate floods caused by service water line breaks

> SAMA 8 - Provide the capability to align a direct feed to the 1B3-SB transformer to preclude battery depletion, and to align the "C" charging/safety injection pump (CSIP) for seal injection

The staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits.

5.2.6 Conclusions

The staff reviewed CP&L's analysis and concluded that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by CP&L are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was somewhat limited by the unavailability of an external event PSA, the likelihood of there being cost-beneficial enhancements in this area was minimized by improvements that have been realized as a result of the IPEEE process, and increasing the estimated SAMA benefits for internal events by a factor of two to account for potential benefits in external events.

Based on its review of the SAMA analysis, the staff concurs with CP&L's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of all or a subset of potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the staff considers that further evaluation of these SAMAs by CP&L is warranted. However, none of the potentially cost-beneficial SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of the license renewal pursuant to 10 CFR Part 54.

5.3 References

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6.0 ENVIRONMENTAL IMPACTS OF THE URANIUM FUEL CYCLE AND SOLID WASTE MANAGEMENT

Environmental issues associated with the uranium fuel cycle and solid waste management are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999.)[(1)] The GEIS includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues are then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective off-site radiological impacts from the fuel cycle and from high-level waste [HLW] and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1, and therefore, additional plant-specific review of these issues is required. There are no Category 2 issues for the uranium fuel cycle and solid waste management.

This chapter addresses the issues that are related to the uranium fuel cycle and solid waste management during the license renewal term that are listed in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B, and are applicable to Shearon Harris Nuclear Power Plant, Unit 1 (HNP) The generic potential impacts of the radiological and nonradiological environmental impacts of the uranium fuel cycle and transportation of nuclear fuel and wastes are described in detail in the GEIS based, in part, on the generic impacts provided in 10 CFR 51.51(b), Table S-3, "Table of Uranium Fuel Cycle Environmental Data," and in 10 CFR 51.52, Table S-4, "Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-

(1) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1

Cooled Nuclear Power Reactor." The U.S. Nuclear Regulatory Commission (NRC) staff also addresses the impacts from radon-222 and technetium-99 in the GEIS.

6.1 The Uranium Fuel Cycle

Category 1 issues in 10 CFR Part 51, Subpart A, Appendix B, Table B-1 that are applicable to HNP from the uranium fuel cycle and solid waste management are listed in Table 6-1.

Table 6-1. Category 1 Issues Applicable to the Uranium Fuel Cycle and Solid Waste Management During the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
URANIUM FUEL CYCLE AND WASTE MANAGEMENT	
Offsite radiological impacts (individual effects from other than the disposal of spent fuel and high level waste)	6.1; 6.2.1; 6.2.2.1; 6.2.2.3; 6.2.3; 6.2.4; 6.6
Offsite radiological impacts (collective effects)	6.1; 6.2.2.1; 6.2.3; 6.2.4; 6.6
Offsite radiological impacts (spent fuel and high level waste disposal)	6.1; 6.2.2.1; 6.2.3; 6.2.4; 6.6
Nonradiological impacts of the uranium fuel cycle	6.1; 6.2.2.6; 6.2.2.7; 6.2.2.8; 6.2.2.9; 6.2.3; 6.2.4; 6.6
Low-level waste storage and disposal	6.1; 6.2.2.2;6.4.2; 6.4.3; 6.4.3.1; 6.4.3.2; 6.4.3.3; 6.4.4; 6.4.4.1; 6.4.4.2; 6.4.4.3; 6.4.4.4; 6.4.4.5; 6.4.4.5.1; 6.4.4.5.2; 6.4.4.5.3; 6.4.4.5.4; 6.4.4.6;6.6
Mixed waste storage and disposal	6.4.5.1; 6.4.5.2; 6.4.5.3; 6.4.5.4; 6.4.5.5; 6.4.5.6; 6.4.5.6.1; 6.4.5.6.2; 6.4.5.6.3; 6.4.5.6.4; 6.6
On-site spent fuel	6.1; 6.4.6; 6.4.6.1; 6.4.6.2; 6.4.6.3; 6.4.6.4; 6.4.6.5; 6.4.6.6; 6.4.6.7; 6.6
Nonradiological waste	6.1; 6.5; 6.5.1; 6.5.2; 6.5.3; 6.6
Transportation	6.1; 6.3.1; 6.3.2.3; 6.3.3; 6.3.4; 6.6, Addendum 1

Progress Energy stated in its Environmental Report (ER) for HNP (Progress Energy 2006) that it is not aware of any new and significant information associated with the renewal of the HNP operating licenses. The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For these issues, the NRC staff concluded in the GEIS that the impacts are SMALL except for the collective offsite radiological impacts from the fuel cycle and from high level waste (HLW) and spent fuel disposal, as discussed below, and that additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

A brief description of the staff review and the GEIS conclusions, as codified in Table B-1, 10 CFR 51, for each of these issues follows:

- Offsite radiological impacts (individual effects from other than the disposal of spent fuel and high level waste). Based on information in the GEIS, the Commission found that

  > Off-site impacts of the uranium fuel cycle have been considered by the Commission in Table S-3 of this part [10 CFR 51.51(b)]. Based on information in the GEIS, impacts on individuals from radioactive gaseous and liquid releases including radon-222 and technetium-99 are small.

  The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no offsite radiological impacts of the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

- Offsite radiological impacts (collective effects). Based on information in the GEIS, the Commission found that

  > The 100 year environmental dose commitment to the U.S. population from the fuel cycle, high level waste and spent fuel disposal excepted, is calculated to be about 14,800 person-rem, or 12 cancer fatalities, for each additional 20-year power reactor operating term. Much of this, especially the contribution of radon releases from mines and tailing piles, consists of tiny doses summed over large populations. This same dose calculation can theoretically be extended to include many tiny doses over additional thousands of years as well as doses outside the U.S. The result of such a calculation would be thousands of cancer fatalities from the fuel cycle, but this result assumes that even tiny doses have some statistical adverse health effect which will not ever be mitigated (for example no cancer cure in the next thousand years), and that these doses projected over thousands of years are meaningful. However, these assumptions are questionable. In particular, science cannot rule out the possibility that there will be no cancer fatalities from these tiny doses. For perspective, the doses are very small fractions of regulatory limits and even smaller fractions of natural background exposure to the same populations.

> Nevertheless, despite all the uncertainty, some judgment as to the regulatory NEPA [National Environmental Policy Act] implications of these matters should be made and it makes no sense to repeat the same judgment in every case. Even taking the uncertainties into account, the Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the collective effects of the fuel cycle, this issue is considered Category 1.

The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no offsite radiological impacts (collective effects) from the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

- <u>Offsite radiological impacts (spent fuel and high level waste disposal).</u> Based on information in the GEIS, the Commission found that

> For the high level waste and spent fuel disposal component of the fuel cycle, there are no current regulatory limits for offsite releases of radionuclides for the current candidate repository site. However, if we assume that limits are developed along the lines of the 1995 National Academy of Sciences (NAS) report, "Technical Bases for Yucca Mountain Standards," and that in accordance with the Commission's Waste Confidence Decision, 10 CFR 51.23, a repository can and likely will be developed at some site which will comply with such limits, peak doses to virtually all individuals will be 1 mSv (100 millirem) per year or less. However, while the Commission has reasonable confidence that these assumptions will prove correct, there is considerable uncertainty since the limits are yet to be developed, no repository application has been completed or reviewed, and uncertainty is inherent in the models used to evaluate possible pathways to the human environment. The NAS report indicated that 1 mSv [100 millirem] per year should be considered as a starting point for limits for individual doses, but notes that some measure of consensus exists among national and international bodies that the limits should be a fraction of the 1 mSv [100 millirem] per year. The lifetime individual risk from 1 mSv [100 millirem] annual dose limit is about 3×10^{-3}.
>
> Estimating cumulative doses to populations over thousands of years is more problematic. The likelihood and consequences of events that could seriously compromise the integrity of a deep geologic repository were evaluated by the Department of Energy in the "Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste," October 1980

> [DOE 1980]. The evaluation estimated the 70-year whole-body dose commitment to the maximum individual and to the regional population resulting from several modes of breaching a reference repository in the year of closure, after 1,000 years, after 100,000 years, and after 100,000,000 years. Subsequently, the NRC and other federal agencies have expended considerable effort to develop models for the design and for the licensing of a high level waste repository, especially for the candidate repository at Yucca Mountain. More meaningful estimates of doses to population may be possible in the future as more is understood about the performance of the proposed Yucca Mountain repository. Such estimates would involve very great uncertainty, especially with respect to cumulative population doses over thousands of years. The standard proposed by the NAS is a limit on maximum individual dose. The relationship of potential new regulatory requirements, based on the NAS report, and cumulative population impacts has not been determined, although the report articulates the view that protection of individuals will adequately protect the population for a repository at Yucca Mountain. However, U.S. Environmental Protection Agency's (EPA's) generic repository standards in 40 CFR Part 191 generally provide an indication of the order of magnitude of cumulative risk to population that could result from the licensing of a Yucca Mountain repository, assuming the ultimate standards will be within the range of standards now under consideration. The standards in 40 CFR Part 191 protect the population by imposing "containment requirements" that limit the cumulative amount of radioactive material released over 10,000 years. Reporting performance standards that will be required by EPA are expected to result in releases and associated health consequences in the range between 10 and 100 premature cancer deaths with an upper limit of 1,000 premature cancer deaths world-wide for a 100,000 metric tonne (MTHM) repository.
>
> Nevertheless, despite all the uncertainty, some judgment as to the regulatory NEPA implications of these matters should be made and it makes no sense to repeat the same judgment in every case. Even taking the uncertainties into account, the Commission concludes that these impacts are acceptable in that these impacts would not be sufficiently large to require the NEPA conclusion, for any plant, that the option of extended operation under 10 CFR Part 54 should be eliminated. Accordingly, while the Commission has not assigned a single level of significance for the impacts of spent fuel and high level waste disposal, this issue is considered Category 1.

On February 15, 2002, based on a recommendation by the Secretary of the Department of Energy, the President recommended the Yucca Mountain site for the development of a repository for the geologic disposal of spent nuclear fuel and high-level nuclear waste. The U.S. Congress approved this recommendation on July 9, 2002, in House Joint Resolution 87, which designated Yucca Mountain as the repository for spent nuclear waste.

On July 23, 2002, the President signed House Joint Resolution 87 into law; Public Law 107-200, 116 Stat. 735 (2002) designates Yucca Mountain as the repository for spent nuclear waste. This development does not represent new and significant information with respect to the offsite radiological impacts from license renewal related to disposal of spent nuclear fuel and high-level nuclear waste.

EPA developed Yucca Mountain-specific repository standards, which were subsequently adopted by the NRC in 10 CFR Part 63. In an opinion, issued July 9, 2004, the U.S. Court of Appeals for the District of Columbia Circuit (the Court) vacated EPA's radiation protection standards for the candidate repository, which required compliance with certain dose limits over a 10,000-year period. The Court's decision also vacated the compliance period in NRC's licensing criteria for the candidate repository in 10 CFR Part 63. In response to the Court's decision, EPA issued its proposed revised standards on August 22, 2005 (70 Federal Register [FR] 49014). In order to be consistent with EPA's revised standards, NRC proposed revisions to 10 CFR Part 63 on September 8, 2005 (70 FR 53313).

Therefore, for the high-level waste and spent fuel disposal component of the fuel cycle, there is some uncertainty with respect to regulatory limits for offsite releases of radioactive nuclides for the current candidate repository site. However, prior to promulgation of the affected provisions of the Commission's regulations, we assumed that limits would be developed along the lines of the 1995 NAS report, *Technical Bases for Yucca Mountain Standards* (NAS 1995), and that in accordance with the Commission's Waste Confidence Decision, 10 CFR 51.23, a repository that would comply with such limits could and likely would be developed at some site.

Despite the current uncertainty with respect to these rules, some judgment as to the regulatory NEPA implications of offsite radiological impacts of spent fuel and high-level waste disposal should be made. The NRC staff concludes that these impacts are acceptable in that the impacts would not be sufficiently large to require the NEPA conclusion that the option of extended operation under 10 CFR Part 54 should be eliminated.

The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no offsite radiological impacts related to spent fuel and HLW disposal during the renewal term beyond those discussed in the GEIS.

- <u>Nonradiological impacts of the uranium fuel cycle</u>. Based on information in the GEIS, the Commission found that

> The nonradiological impacts of the uranium fuel cycle resulting from the renewal of an operating license for any plant are found to be small.

The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no nonradiological impacts of the uranium fuel cycle during the renewal term beyond those discussed in the GEIS.

- Low-level waste storage and disposal. Based on information in the GEIS, the Commission found that

> The comprehensive regulatory controls that are in place and the low public doses being achieved at reactors ensure that the radiological impacts to the environment will remain small during the term of a renewed license. The maximum additional on-site land that may be required for low-level waste storage during the term of a renewed license and associated impacts will be small.
>
> Non-radiological impacts on air and water will be negligible. The radiological and non-radiological environmental impacts of long-term disposal of low-level waste from any individual plant at licensed sites are small. In addition, the Commission concludes that there is reasonable assurance that sufficient low-level waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.

The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no impacts of low-level waste storage and disposal associated with the renewal term beyond those discussed in the GEIS.

- Mixed waste storage and disposal. Based on information in the GEIS, the Commission found that

> The comprehensive regulatory controls and the facilities and procedures that are in place ensure proper handling and storage, as well as negligible doses and exposure to toxic materials for the public and the environment at all plants. License renewal will not increase the small, continuing risk to human health and the environment posed by mixed waste at all plants. The radiological and non-radiological environmental impacts of long-term disposal of mixed waste from any individual plant at licensed sites are small. In addition, the Commission concludes that there is reasonable assurance that sufficient mixed waste disposal capacity will be made available when needed for facilities to be decommissioned consistent with NRC decommissioning requirements.

The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no impacts of mixed waste storage and disposal associated with the renewal term beyond those discussed in the GEIS.

- On-site spent fuel. Based on information in the GEIS, the Commission found that

> The expected increase in the volume of spent fuel from an additional 20 years of operation can be safely accommodated on site with small environmental effects through dry or pool storage at all plants if a permanent repository or monitored retrievable storage is not available.

The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no impacts of onsite spent fuel associated with license renewal beyond those discussed in the GEIS.

- Nonradiological waste. Based on information in the GEIS, the Commission found that

> No changes to generating systems are anticipated for license renewal. Facilities and procedures are in place to ensure continued proper handling and disposal at all plants.

The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no nonradiological waste impacts during the renewal term beyond those discussed in the GEIS.

- Transportation. Based on information contained in the GEIS, the Commission found that

> The impacts of transporting spent fuel enriched up to 5 percent uranium-235 with average burnup for the peak rod to current levels approved by NRC up to 62,000 MWd/MTU and the cumulative impacts of transporting high-level waste to a single repository, such as Yucca Mountain, Nevada are found to be consistent with the impact values contained in 10 CFR 51.52, Summary Table S-4—Environmental Impact of Transportation of Fuel and Waste to and from One Light-Water-Cooled Nuclear Power Reactor. If fuel enrichment or burnup conditions are not met, the applicant must submit an assessment of the implications for the environmental impact values reported in § 51.52.

HNP meets the fuel-enrichment and burnup conditions set forth in Addendum 1 to the GEIS. The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006), the staff's site visit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no impacts of transportation associated with license renewal beyond those discussed in the GEIS.

6.2 References

10 CFR 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR 54. Code of Federal Regulations, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

10 CFR 63. Code of Federal Regulations, Title 10, *Energy*, Part 63, "Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada."

40 CFR 191. Code of Federal Regulations, Title 40, *Protection of Environment*, Part 191, "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Waste."

Carolina Power & Light Company, Progress Energy Carolinas Inc., (Progress Energy). 2006. Shearon Harris Unit 1, *Applicant's Environmental Report, Operating License Renewal Stage.* Raleigh, North Carolina. Accessible at ML063350276.

National Academy of Sciences (NAS). 1995. Technical Bases for Yucca Mountain Standards. Washington, D.C.

National Environmental Policy Act (NEPA) of 1969, as amended, 42 USC 4321, et. seq.

U.S. Department of Energy (DOE). 1980. Final Environmental Impact Statement: Management of Commercially Generated Radioactive Waste. DOE/EIS-0046F, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1996. Generic Environmental Impact Statement for License Renewal of Nuclear Plants. NUREG-1437, Volumes 1 and 2, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999. Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Main Report, "Section 6.3 – Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants, Final Report." NUREG-1437, Volume 1, Addendum 1, Washington, D.C.

7.0 ENVIRONMENTAL IMPACTS OF DECOMMISSIONING

Environmental impacts from the activities associated with the decommissioning of any reactor before or at the end of an initial or renewed license are evaluated in the *Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities: Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors, NUREG-0586, Supplement 1* (NRC 2002). The U.S. Nuclear Regulatory Commission (NRC) staff's evaluation of the environmental impacts of decommissioning presented in NUREG-0586, Supplement 1, identifies a range of impacts for each environmental issue.

The incremental environmental impacts associated with decommissioning activities resulting from continued plant operation during the renewal term are discussed in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).(1) The GEIS includes a determination of whether the analysis of the environmental issue could be applied to all plants and whether additional mitigation measures would be warranted. Issues were then assigned a Category 1 or a Category 2 designation. As set forth in the GEIS, Category 1 issues are those that meet all of the following criteria:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective off-site radiological impacts from the fuel cycle and from high level waste and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

For issues that meet the three Category 1 criteria, no additional plant-specific analysis is required unless new and significant information is identified.

Category 2 issues are those that do not meet one or more of the criteria for Category 1, and therefore, additional plant-specific review of these issues is required. There are no Category 2 issues related to decommissioning.

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(1) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

7.1 Decommissioning

Category 1 issues in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B that are applicable to Shearon Harris Nuclear Power Plant, Unit 1 (HNP) decommissioning following the renewal term are listed in Table 7-1. Carolina Power and Light Company (CP&L) stated in its Environmental Report (ER) (Progress Energy 2006) that it is aware of no new and significant information regarding the environmental impacts of HNP license renewal. The NRC staff has not identified any new and significant information during its independent review of the HNP, the staff's site audit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no impacts related to these issues beyond those discussed in the GEIS. For all of these issues, the NRC staff concluded in the GEIS that the impacts are SMALL, and additional plant-specific mitigation measures are not likely to be sufficiently beneficial to be warranted.

Table 7-1. Category 1 Issues Applicable to the Decommissioning of HNP Following the Renewal Term

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	GEIS Section
DECOMMISSIONING	
Radiation Doses	7.3.1; 7.4
Waste Management	7.3.2; 7.4
Air Quality	7.3.3; 7.4
Water Quality	7.3.4; 7.4
Ecological Resources	7.3.5; 7.4
Socioeconomic Impacts	7.3.7; 7.4

A brief description of the NRC staff's review and the GEIS conclusions, as codified in Table B-1, for each of the issues follows:

- Radiation doses. Based on information in the GEIS, the Commission found that

  > Doses to the public will be well below applicable regulatory standards regardless of which decommissioning method is used. Occupational doses would increase no more than 1 man-rem caused by buildup of long-lived radionuclides during the license renewal term.

  The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006), the staff's site audit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no radiation dose impacts associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

- Waste management. Based on information in the GEIS, the Commission found that

> Decommissioning at the end of a 20-year license renewal period would generate no more solid wastes than at the end of the current license term. No increase in the quantities of Class C or greater than Class C wastes would be expected.

The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006), the staff's site audit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no impacts from solid waste associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

- Air quality. Based on information in the GEIS, the Commission found that

> Air quality impacts of decommissioning are expected to be negligible either at the end of the current operating term or at the end of the license renewal term.

The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006), the staff's site audit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no impacts on air quality associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

- Water quality. Based on information in the GEIS, the Commission found that

> The potential for significant water quality impacts from erosion or spills is no greater whether decommissioning occurs after a 20-year license renewal period or after the original 40-year operation period, and measures are readily available to avoid such impacts.

The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006), the staff's site audit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no impacts on water quality associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

- Ecological resources. Based on information in the GEIS, the Commission found that

> Decommissioning after either the initial operating period or after a 20-year license renewal period is not expected to have any direct ecological impacts.

The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006), the staff's site audit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no impacts on ecological resources associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

- Socioeconomic Impacts. Based on information in the GEIS, the Commission found that

> Decommissioning would have some short-term socioeconomic impacts. The impacts would not be increased by delaying decommissioning until the end of a 20-year relicense period, but they might be decreased by population and economic growth.

The NRC staff has not identified any new and significant information during its independent review of the HNP ER (Progress Energy 2006), the staff's site audit, the scoping process, or its evaluation of other available information. Therefore, the NRC staff concludes that there are no socioeconomic impacts associated with decommissioning following the license renewal term beyond those discussed in the GEIS.

7.2 References

10 CFR Part 51. *Code of Federal Regulations,* Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

Carolina Power & Light Company, Progress Energy Carolinas Inc., (Progress Energy). 2006. Shearon Harris Unit 1, *Applicant's Environmental Report, Operating License Renewal Stage.* Raleigh, North Carolina. Accessible at ML063350276.

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants.* NUREG-1437, Volumes 1 and 2, Office of Nuclear Regulatory Research, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Main Report*. NUREG-1437, Volume 1, Addendum 1. Office of Nuclear Regulatory Research, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2002. *Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities: Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors.* NUREG-0586, Supplement 1, Volumes 1 and 2. Washington, D.C.

8 .0 ENVIRONMENTAL IMPACTS OF ALTERNATIVES TO LICENSE RENEWAL

In this chapter, U.S. Nuclear Regulatory Commission (NRC) staff examines the potential environmental impacts associated with alternatives to renewing the Shearon Harris Nuclear Power Plant, Unit 1 (HNP) operating license. NRC staff considers the following alternatives: 1) denying the renewal of an operating license (i.e., the no-action alternative); 2) implementing electric generating sources other than HNP; 3) relying on conservation to offset an amount of electric demand equal to HNP's capacity; 4) purchasing electric power from other sources; and 5) implementing a combination of generation and conservation measures. In addition, NRC staff briefly discusses other generation alternatives that they deemed incapable of individually replacing the power generated by HNP. As NRC staff determined in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS) NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999)[(1)], NRC staff will assume that Progress Energy requires power generation capability to meet system generating needs beyond the end of the current HNP operating license.

Since the GEIS assumes that CP&L needs the power currently generated by HNP, NRC staff assumes that CP&L would resort to other forms of power supply or demand reduction (i.e., conservation) if NRC elects the no-action alternative. NRC staff discusses the impacts of these alternatives in Section 8.2. The alternatives considered in Section 8.2 represent other, distinct alternatives to license renewal that allow CP&L to meet future system needs. Though the environmental impacts of these alternatives may also be considered potential consequences of the no-action alternative, they provide options that CP&L may elect to pursue regardless of whether NRC renews the HNP license.

The NRC staff evaluates environmental impacts across 11 categories (land use, ecology, water use and quality, air quality, waste, human health, socioeconomics, transportation, aesthetics, historical and archaeological resources, and environmental justice) using the NRC's three-level standard of significance—SMALL, MODERATE, or LARGE. NRC developed these standards by using Council on Environmental Quality guidelines. NRC staff outlines these standards in the footnotes to Table B-1 of Title 10, Part 51, of the *Code of Federal Regulations* (10 CFR Part 51), Subpart A, Appendix B:

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

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(1) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

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

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

The impact categories NRC staff used in this chapter are the same categories NRC staff used in the GEIS, with the additional impact category of environmental justice.

8.1 <u>No-Action Alternative</u>

NRC regulations implementing the National Environmental Policy Act (NEPA) of 1969 require NRC staff to discuss the no-action alternative in any NRC environmental impact statement (EIS, see 10 CFR Part 51, Subpart A, Appendix A(4)). For license renewal, the no-action alternative means that NRC does not renew the HNP operating license. The HNP operating license would then expire in 2026, causing CP&L to cease plant operations.

If, after performing safety and environmental reviews of HNP's license renewal application, NRC acts to renew HNP's operating license, then CP&L may choose to continue operating HNP throughout the renewal term. If this occurs, then shutdown of the unit and decommissioning activities would be postponed for up to an additional 20 years. NRC staff expects that the impacts of decommissioning after 60 years of operation would not differ significantly from those that would occur after 40 years of operation.

NRC staff addresses the environmental impacts of decommissioning in several documents, including the *Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities*, NUREG-0586, Supplement 1 (NRC 2002); the license renewal GEIS (chapter 7; NRC 1996); and Chapter 7 of this draft supplemental environmental impact statement (SEIS). These analyses either directly address or bound the environmental impacts of decommissioning whenever CP&L ceases operating HNP.

The aforementioned documents do not, however, address environmental impacts that occur after plant shutdown and before the actual decommissioning process begins. In the following section, NRC staff considers the immediate impacts from plant shutdown. The impacts are summarized in Table 8-1.

- Land Use

  Onsite land use would not be affected immediately by the cessation of operations. Plant structures and other facilities would likely remain in place until decommissioning. CP&L plans to keep transmission lines associated with the project in service after the plant stops operating. As a result, maintenance of the rights-of-way would continue as before. Since the NRC staff concluded in Chapter 4 that continued operations would have a SMALL impact on land use, and as plant shutdown would have little or no immediate effect on land use practices, the NRC staff concludes that the impacts to land use from plant shutdown would be SMALL.

- Ecology

Ecology would be minimally affected by plant shutdown. HNP utilizes a cooling tower rather than once-through cooling, which makes aquatic ecology impacts from operations SMALL. CP&L would continue to maintain Harris Reservoir after shutdown. CP&L staff may allow access to the auxiliary reservoir following shutdown, which would increase fishing pressure on this impoundment and may introduce invasive species. Impacts to ecology in the auxiliary reservoir, though, would probably not be noticeable. Decreased withdrawals from Harris Reservoir may increase flows to Buckhorn Creek and the Cape Fear River. These effects would be positive, though also likely SMALL. CP&L would continue to use HNP's transmission lines and maintain right-of-way corridors. CP&L would generally continue to maintain the site until decommissioning. Since NRC staff determined that continued operation of HNP into the license renewal term would have SMALL impacts to ecology, and since few changes would occur to ecological resources following shutdown, the NRC staff concludes that ecological impacts from shutdown of the plant would be SMALL.

- Water Use and Quality—Surface Water

When the plant stops operating, consumptive water use for cooling tower makeup would immediately decrease and HNP would discharge much less blow-down water to Harris Reservoir. As CP&L would maintain Harris Reservoir even in the event of plant shutdown, this net reduction in consumptive water use would increase the amount of water flowing out of Harris Reservoir and into Buckhorn Creek, as well as to the Cape Fear River. This would have a positive impact to surface water use and quality. Since NRC staff determined in Chapter 4 that continued operation would have a SMALL impact on surface water quality and use, cessation of a portion of these impacts would also be SMALL.

- Water Use and Quality—Groundwater

HNP currently relies on surface water from Harris Reservoir for all domestic, process, and makeup water. Though construction crews developed 20 wells between 1973 and 1981, none of the wells remain in use. If CP&L shuts the plant down, it is possible that water flows out of Harris Reservoir and into Buckhorn Creek would increase, and groundwater recharge from the stream may also increase. It is unlikely, however, that this effect would be noticeable. Since NRC staff determined in Chapter 4 that continued operation of HNP would have no impact on groundwater resources, a small, positive impact from plant shutdown would result in a SMALL overall impact to groundwater use and quality from plant shutdown.

- Air Quality

When the plant stops operating, there would be a reduction in emissions from activities related to plant operation such as use of diesel generators and workers' vehicles. In Chapter 4, NRC staff determined that these emissions would have a SMALL impact on air quality during the renewal term. Therefore, if the emissions decrease, the impact to air quality would also decrease and would be SMALL.

- Waste

When the plant stops operating, it would stop generating high-level waste, and it would generate fewer low-level and mixed waste from plant operation and maintenance. Since the NRC staff determined in Chapter 6 that continued low-level and mixed waste generation would have a SMALL impact, a reduction in waste generation would have an even smaller impact. Therefore, the NRC staff concludes that waste impacts from plant shutdown would be SMALL, and less than during operation.

- Human Health

After shutdown the plant would release smaller amount of radioactive gaseous and liquid materials to the environment than it did while operating. In addition, the variety of potential accidents at the plant would decline to a limited set associated with shutdown events and fuel handling. Since NRC staff determined in Chapter 4 that continued plant operations would have a SMALL impact on human health, and since NRC staff also determined in Chapter 5 that potential accidents during the renewal term would have a SMALL impact, then reducing the amounts of gaseous and liquid releases while simplifying and limiting the types of potential accidents the plant may experience would further reduce impacts to human health. Impacts to human health from plant shutdown, then, are SMALL.

- Socioeconomics

There would be immediate socioeconomic impacts associated with the shutdown of the plant because of the reduction in staff at the plant. These effects would likely not be noticeable, however, given the region's rapid growth rate and variety of economic activities. Decommissioning activities or construction and operation of an alternative at the current site would offset these impacts. There also may be an immediate, though relatively small, reduction in property tax revenues for Wake County, which could also be offset by an alternative. In Chapter 4, the NRC staff determined that continued plant operations would have no effect on socioeconomics. Since the socioeconomic effects of plant shutdown would likely not be noticeable, plant shutdown would have a SMALL impact. See Appendix J to NUREG-0586, Supplement 1 (NRC 2002), for additional discussion of the potential socioeconomic impacts of plant decommissioning.

- Transportation

Cessation of operations would be accompanied by reduced traffic in the vicinity of the plant. This reduction occurs largely because the post-shutdown workforce would be smaller than the operating workforce. Shipments of materials to and from the plant would also decrease. As the NRC staff determined in Chapter 4 that continued operational transportation impacts would have a SMALL impact, a reduction in these effects means that impacts remain SMALL if the plant shuts down.

- Aesthetics

Plant structures and other facilities are likely to remain in place until decommissioning. Plumes from the cooling tower would cease or greatly decrease after shutdown. Therefore, the NRC staff concludes that the aesthetic impacts of plant closure would be SMALL.

- Historic and Archaeological Resources

Onsite lands and underlying archaeological resources would not be affected immediately by shutdown, as plant structures and other facilities are likely to remain in place until decommissioning. CP&L would continue to operate the plant's transmission lines and maintain Harris Reservoir. Transmission line right-of-way maintenance would continue. As NRC staff determined in Chapter 4 that these practices would have a SMALL impact on historic and archaeological resources, then continuation of these practices after plant shutdown would also have SMALL impacts.

- Environmental Justice

Impacts on minority and low-income populations due to the shutdown of HNP would depend on the number of jobs and the amount of tax revenue lost to the communities surrounding the power plant. Closure of HNP would reduce the overall number of jobs and tax revenue generated in the region that was directly and indirectly attributed to plant operations. However, given the rapid economic growth of Wake County and the Raleigh-Durham area, it is likely that these losses would be replaced by the development of new businesses and new sources of tax revenue in the region. Since CP&L's tax payments represent a small percentage of Wake County's total annual property tax revenue, it is unlikely that social services would be seriously affected. Therefore, minority and low-income populations in the vicinity of HNP would not likely experience any disproportionately high and adverse socioeconomic impacts from the shutdown of HNP.

The environmental effect of plan shutdown would reduce the amount of operational impacts on the environment. Therefore, minority and low-income populations in the vicinity of HNP would not likely experience any disproportionately high and adverse environmental impacts from the shutdown of HNP.

Table 8-1. Summary of Environmental Impacts of the No-Action Alternative

Impact Category	Impact	Comment
Land Use	SMALL	Impacts are expected to be SMALL because plant shutdown is not expected to result in changes to onsite or offsite land use.
Ecology	SMALL	Impacts from shutdown are expected to be SMALL because aquatic impacts are generally reduced and terrestrial impacts are not expected because there would not be any land use or maintenance changes.
Water Use and Quality—Surface Water	SMALL	Impacts are expected to be SMALL because surface water intake and discharges would decrease.
Water Use and Quality—Groundwater	No Change	The current plant uses no groundwater and no more would be extracted if CP&L shuts the plant down.
Air Quality	SMALL	Impacts are expected to be SMALL because emissions related to plant operation and worker transportation would decrease.
Waste	SMALL	Impacts are expected to be SMALL because generation of high-level waste would stop, and generation of low-level and mixed waste would decrease.
Human Health	SMALL	Impacts are expected to be SMALL because radiological doses to workers and members of the public, which are currently within regulatory limits, would be reduced.
Socioeconomics	SMALL	Impacts are expected to be SMALL because of small relative decreases in employment and tax revenues. Regional growth would likely offset most, if not all, impacts.
Socioeconomics (Transportation)	SMALL	Impacts are expected to be SMALL because of the decrease in commuter traffic to the plant.
Aesthetics	SMALL	Impacts are expected to be SMALL because plant

Impact Category	Impact	Comment
		structures would remain in place.
Historic and Archaeological Resources	SMALL	Impacts are expected to be SMALL because shutdown of the plant would not change land use or disturbance.
Environmental Justice	SMALL	Impacts are expected to be SMALL because plant shutdown is unlikely to disproportionately affect minority or low-income populations.

8.2 Alternative Energy Sources

In this section, NRC staff discusses the environmental impacts of alternatives to license renewal that would meet system energy needs after the expiration of HNP's current license or whenever CP&L elects to cease operating HNP. These alternatives include alternate sources of electric power (generation alternatives and purchased power), as well as an equivalent amount of conservation. If NRC renews the HNP operating license, the decision of whether to continue operating HNP or whether to rely on an alternative is left to Progress Energy and state-level energy decision makers.

The NRC staff considers the following generation alternatives in detail:

- Supercritical coal-fired generation at the HNP site and at an alternate site (Section 8.2.1)
- Integrated gasification combined-cycle coal-fired generation at the HNP site and at an alternate site (Section 8.2.2)
- Natural gas combined-cycle generation at the HNP site and at an alternate site (Section 8.2.3)
- New nuclear generation at the HNP site and at an alternate site (Section 8.2.4)

The NRC staff considers the following non-generation alternatives to license renewal in detail:

- Utility-sponsored conservation programs (Section 8.2.5)
- Purchased power (Section 8.2.6)

The order of alternatives does not imply which alternatives the NRC staff considers most likely or most environmentally benign.

The NRC staff addresses other alternatives considered and found not to be reasonable replacements for HNP in Section 8.2.7. Section 8.2.8 presents the environmental impacts of a combination of generation and conservation alternatives. This combination includes several alternatives that the NRC staff determined to be insufficient as stand-alone alternatives to HNP license renewal.

Each year the Energy Information Administration (EIA), a branch of the U.S. Department of Energy (DOE), issues the updated *Annual Energy Outlook* (*AEO*). The *AEO* is a forecasting document that analyzes trends and issues in energy production, supply, and consumption in order to project future energy developments. The projections in the *AEO* vary from year to year based on current events. Its comprehensiveness and policy-neutrality is unique among forecasting documents. In the *Annual Energy Outlook 2007 with Projections to 2030*, EIA projects a continued nationwide increase in energy consumption and generating capacity (DOE/EIA 2007). Early in this period, through 2010, EIA projects that gas-fired combined-cycle or combustion turbine technology will account for most generating capacity additions. As natural gas prices increase, coal-fired generation begins to account for the largest share of capacity additions. EIA projects that coal will account for the majority (54%) of new capacity through 2030. EIA also projects that advanced coal technologies, like coal-fueled integrated gasification combined-cycle generation, will decline in cost relative to improved natural-gas-fired combined-cycle technologies. EIA projections indicate that U.S. generators will increase total nuclear and renewable generation capacity throughout the forecast term, due partly to tax credits and other incentives. As a proportion of installed capacity, however, nuclear generation will decrease slightly through 2030, while renewables' share will remain relatively constant (DOE/EIA 2007). EIA indicates that changes in electricity generation costs, which are highly dependent on emissions-control costs, will drive utilities' choices in generating technologies.

EIA asserts that oil-fired plants will account for virtually no new generation capacity in the U.S. through 2030, and furthermore projects a 0.6% annual decrease in electric sector oil consumption because of higher fuel costs and lower efficiencies relative to other technologies (DOE/EIA 2007). Given EIA's analysis, NRC staff will not consider an oil-fired alternative for HNP.

HNP has a net rating of 900 megawatts electric output (MWe) net. To simplify alternatives analysis in the HNP ER, CP&L developed a set of fossil-fueled alternatives that would approximately, but not exactly, replace this capacity (Progress Energy 2006b). CP&L selected alternative capacity based on the commercially available combined-cycle gas generators that would best approximate HNP's capacity. After reviewing several manufacturers' product lines (e.g., Siemens and General Electric), NRC staff determined that CP&L's approximation of 879 MWe provides an adequate estimate of potential environmental impacts and also noted that this approximation may understate impacts by approximately 2.4% in cases where plant output and environmental impact correlate directly and linearly. NRC staff also employed this capacity as a suitable approximation of both supercritical and integrated gasification combined-cycle coal-fired alternatives.[2]

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(2) While supercritical coal-fired plants rely on conventional boiler technology operated at higher pressures and temperatures, integrated gasification combined-cycle (IGCC) plants use coal (or other solid or liquid feedstocks) to produce syngas that burns in a combined-cycle plant similar to that used for

In the HNP ER, CP&L identified several possible alternatives, all of which would be constructed at the current HNP site. Given that the current site includes approximately 4370 ha (10,800 ac), of which 1680 ha (4150 ac) is Harris Reservoir, (Progress Energy 2006b) as well as cooling water, plant auxiliary buildings and infrastructure, and transmission lines, NRC staff believes that the HNP site allows adequate area for construction of all proposed alternatives. CP&L also owns additional land around the HNP site that it does not consider part of the site. NRC staff notes that CP&L's potential plans for two additional nuclear units at the site would raise the reservoir level to flood an additional 1540 ha (3800 ac). Even if CP&L raises the Harris Reservoir level to support two potential new nuclear plants onsite, NRC staff believes sufficient land would exist to construct an alternative to the existing unit, though it may be necessary to convert nearby CP&L-owned land to plant use to support some of the more land-intensive alternatives. In addition to considering impacts from alternatives at the HNP site, the NRC staff will also generally characterize impacts for alternate sites.

8.2.1 Supercritical Conventional Coal-Fired Generation

In this section, NRC staff analyzes a new supercritical coal-fired boiler, the first of two coal-fired alternatives. Supercritical coal-fired plants are similar to conventional coal boilers, except they operate at slightly higher temperatures and higher pressures, which allows for greater thermal efficiency. Supercritical coal-fired boilers are commercially proven and represent an increasing proportion of new coal-fired power plants. In Section 8.2.2, NRC staff presents the second coal-fired alternative, a new integrated gasification combined-cycle (IGCC) coal-fired plant.

NRC staff considers constructing a supercritical coal-fired power plant at both the HNP site and at an alternate site. Construction of a coal-fired plant at an alternate site may necessitate the construction of new transmission lines to transmit power to CP&L's system. Transmission line length would vary with distance to suitable existing lines. In addition, construction at an alternate site would necessitate the construction of an appropriate railroad spur (or other transportation infrastructure) for coal and lime deliveries.

NRC staff has re-evaluated CP&L's analysis assuming a better plant efficiency or heat rate of 8844 British thermal units (BTU) of heat per kilowatt-hour (kWh), the value EIA reports as the heat rate for new, scrubbed coal plants in 2005, the most recent year for which NRC staff identified data (DOE/EIA 2006b). This would reduce by approximately 13.3% the level of emissions CP&L calculated in the HNP ER for some impact areas. NRC staff accepts CP&L's proposed coal-fired alternative configuration, which consists of two 439.5 MWe net coal-fired units (approximately 468 MW gross electric power each, assuming 6% onsite power consumption). NRC staff notes that this may understate some impacts, like air emissions, by

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natural gas. Thus, an approximation of this sort is also necessary for the IGCC alternative. Boiler-based coal plants of this size are typically built-to-specifications.

2.4% versus a plant equal in output to HNP. The NRC staff compared this information to environmental impact information in the GEIS, as well as to reference information available from EIA, the Environmental Protection Agency (EPA), and electric industry sources.

Although the operating license renewal period is only 20 years, NRC staff analyzed the impact of operating the coal-fired alternative for 40 years, as this is a reasonable projection of the operating life of a coal-fired plant. This means that only half of certain impacts (land use for waste disposal and coal mining, for example) are directly attributable to the 20 year license renewal period.

The supercritical coal-fired plant, with a gross output of slightly more than 935 MWe would consume approximately 2.27 million metric tons (MT) (2.50 million tons) per year of pulverized bituminous coal with an ash content of approximately 11.6 percent (based on averages for North Carolina coal consumption) (EIA/DOE 2006c) and sulfur content of 0.88 percent. As in Progress Energy's analysis, NRC staff assumed a capacity factor(3) of 0.85 for the supercritical coal-fired alternative (Progress Energy 2006b).

At the HNP site, a coal-fired alternative would likely receive coal and lime (used to scrub sulfur oxides from flue gases) by rail. The coal-fired option would require approximately 5 coal unit trains per week (assuming each train has 100 cars with 100 tons of coal per car). CP&L would have to improve HNP's existing rail spur to allow for these deliveries. Impacts from improving the rail spur would be SMALL, as the area is already disturbed and used for industrial purposes.

In evaluating the supercritical coal-fired alternative, the NRC staff assumed that a new plant located at either the HNP site or an alternate site would use a closed-cycle cooling system, like the current HNP unit does. NRC staff discusses the overall impacts of the supercritical coal-fired generating alternative in the following sections and summarizes these impacts in Table 8-2. The extent of impacts at an alternate site would depend on the location and characteristics of the particular site selected.

- Land Use

  A supercritical coal-fired alternative would use the existing facilities and infrastructure at the HNP site to the extent practicable, limiting the amount of new construction. This alternative may be able to use the existing cooling tower system, switchyard, offices, and transmission line rights-of-way. Much of the land the new plant may use has been previously disturbed.

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(3) The capacity factor is the ratio of electricity generated, for the period of time considered, to the energy that could have been generated at continuous full-power operation during the same period.

In the GEIS (NRC 1996), NRC staff noted that workers would need to convert roughly 700 ha (1700 ac) of land to industrial uses to support a 1000 MWe coal-fired plant. Since some of this area includes space for offices, parking lots, and other auxiliary structures that would be reused from the existing plant, an alternative on the HNP site would require much less land than at a previously undeveloped site. A coal-fired alternative at the HNP site would likely require several hundred acres for new structures, rather than the 655 ha (1590 ac) the GEIS would indicate. CP&L, for example, estimated 102 ha (250 ac) in the HNP ER. Mining operators would create additional land-use changes offsite in an undetermined coal-mining area to supply coal for the plant. Assuming a mix of coal supply similar to North Carolina's current coal supply, this land disturbance would occur mostly in West Virginia (EIA/DOE 2006c). In the GEIS, the NRC staff estimated that supplying coal to a 1000 MWe plant would disturb approximately 8900 ha (22,000 ac) of land for mining the coal and disposing of the wastes during the 40-year operational life. A coal-fired alternative to replace HNP would thus require approximately 8321 ha (20,600 ac) of land, 59.9 ha (148 ac) of which the plant would use for onsite waste disposal over the 40 year life(4). Coal mining would likely take place in existing coal-mining regions and in accordance with applicable mining regulations. Partially offsetting this offsite land use would be the elimination of the need for uranium mining to supply fuel for HNP. In the GEIS, the NRC staff estimated that approximately 400 ha (1000 ac) would be affected for mining the uranium and processing it during the operating life of a 1000 MW nuclear power plant. Depending on when this land area would be needed, it would be possible that some would include areas previously disturbed by nuclear plant structures removed after shutdown or decommissioning, thus minimizing the extent to which any additional land would be required. Should CP&L move ahead with potential plans to construct new nuclear units on the HNP site, a coal-fired alternative may disturb areas that CP&L may not have previously disturbed because the nuclear units would be built first and use the area the coal plant otherwise may have used. Impacts from converting several hundred acres onsite, as well as up to 8321 ha (20,600 ac) for coal and limestone mining and disposal of coal waste, would occur mostly in previously disturbed areas or in existing mining land. NRC staff estimates that these impacts would be LARGE. Improving the rail spur to allow frequent coal and lime deliveries would incur short-lived impacts along the existing rail corridor. These impacts would be SMALL. The overall impact on land use of a coal-fired generating unit at the existing HNP site would be best characterized as LARGE, and would be greater than the operating license renewal alternative.

Construction of the coal-fired generation alternative at an alternate site would impact up to 655 ha (1617 ac) for plant structures (NRC 1996) and 8321 ha (20,600 ac) for mining and waste disposal (59.9 ha [148 ac] of which would occur onsite for waste disposal), and

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(4) Only half of the land area needed for mining and by-product disposal is directly attributable to providing an alternative to renewing HNP's operating license for 20 years.

impacts would be LARGE due not only to plant structures, but also construction of a rail spur, transmission lines, and their respective rights-of-way.

- Ecology

Locating a coal-fired plant at the HNP site would affect ecological resources, but existing site maintenance practices and the site's industrial nature would minimize additional impacts from a new supercritical coal-fired plant. Plant structures, coal storage, and waste disposal would create SMALL to MODERATE impacts. At an alternate site, constructing transmission lines and a rail spur would incur additional impacts, which would be MODERATE to LARGE, depending on the length of corridors required.

Aquatic impacts of a supercritical coal-fired alternative would likely be similar to the impacts of the existing HNP, as the on-site option would make use of the existing plant's cooling, intake, and outflow structures. The lower heat rate of the coal-fired alternative compared to the existing nuclear unit means that less water would be consumed for cooling and blowdown than in the license renewal alternative. Since continued operation of the existing HNP unit would result in SMALL impacts to aquatic ecology, the supercritical coal-fired option would also result in a SMALL impact.

A coal plant at an alternate site would likely also make use of cooling towers, and would incur similar aquatic impacts, which would range from SMALL to MODERATE, depending on characteristics of the water body used for cooling makeup.

1 **Table 8-2**. Summary of Environmental Impacts of Coal-Fired Generation at HNP Site and an
2 Alternate Site Using Closed-Cycle Cooling

Impact Category	HNP Site		Alternate Site	
	Impact	**Comments**	**Impact**	**Comments**
Land Use	MODERATE	Uses several hundred acres for plant and waste disposal, though much of this would have been previously disturbed; additional offsite land impacts for coal and limestone mining affects thousands of acres.	MODERATE to LARGE	Uses approximately 714 ha (1770 ac) for plant, offices, parking, and waste disposal; additional impacts from transmission line, and rail spur, as well as coal and limestone mining.
Ecology	SMALL to MODERATE	Uses undeveloped areas at current HNP site, plus existing rail and transmission corridors; impacts also dependent on land used for coal and limestone mining.	MODERATE to LARGE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and transmission line and rail routes; may cause habitat loss and fragmentation, as well as reduced productivity and biological diversity; impact also dependent on coal and limestone mining.
Water Use and Quality—Surface Water	SMALL	Uses existing cooling tower system, while reduced heat rate means the supercritical coal-fired alternative requires less water than the existing plant.	SMALL to MODERATE	With closed-cycle cooling, the impact would likely be SMALL, though it would depend on the volume of water withdrawn and discharged and the characteristics of the surface water body; impacts would be MODERATE.
Water Use and Quality—Groundwater	SMALL	A new plant onsite would likely continue to rely on Harris Reservoir for all water.	SMALL to MODERATE	Impacts would depend on the volume of water withdrawn and discharged and the characteristics of the aquifers, though groundwater would not likely be used for cooling tower makeup purposes.

Impact Category	HNP Site		Alternate Site	
	Impact	Comments	Impact	Comments
Air Quality	MODERATE	• Sulfur oxides 1900 MT/yr (2090 tons/yr) • Nitrogen oxides 567 MT/yr (625 tons/yr) • Total suspended particulates 132 MT/yr (145 tons/yr) • PM_{10} 30.3 MT/yr (33.4 tons/yr) • Carbon monoxide 567 MT/yr (625 tons/yr) • Small amounts of mercury and other hazardous air pollutants.	MODERATE	Potentially the same impacts as the Harris site, although pollution-control standards may vary.
Waste	MODERATE	Total waste production would be approximately 249,000 MT/yr (274,000 tons/yr) of ash (after some is recycled) and scrubber sludge requiring approximately 59.9 ha (148 ac) for disposal during the 40-year life of the plant. The plant would also generate relatively small amounts of conventional, hazardous, and universal wastes during operation.	MODERATE	Same impacts as at HNP site; waste disposal constraints may vary.
Human Health	SMALL	Impacts are uncertain, but considered SMALL as the plant would comply with health-informed standards in the Clean Air Act and other relevant emissions regulations.	SMALL	Similar impacts to those at the HNP site.

Impact Category	HNP Site		Alternate Site	
	Impact	Comments	Impact	Comments
Socioeconomics	SMALL to MODERATE	During construction, impacts would be SMALL to MODERATE. Up to 2340 workers would be onsite during the peak period of the 4-year construction period, followed by a reduction from the current HNP work force of 720 to 234. Tax base would generally be preserved in Wake County. Impacts during operation would be SMALL.	SMALL to LARGE	Construction impacts depend on location, but would be LARGE if the plant is located in an area that is rural or is growing less quickly than areas near the HNP site. Wake and surrounding counties may lose tax revenue and employment, though economic growth would likely offset much of this loss. Impacts at a site near to an urban area may be SMALL.
Socioeconomics (Transportation)	SMALL to MODERATE	Transportation impacts would likely be SMALL to MODERATE, primarily with construction activities. For rail transportation of coal and lime, the impact would likely be SMALL, depending on the routing of coal trains.	SMALL to LARGE	Transportation impacts could be SMALL to LARGE, primarily during construction. For rail transportation of coal and lime, the impact is likely to be SMALL, but dependent on the routing of coal trains.
Aesthetics	SMALL to MODERATE	Aesthetic impact due to plant units and stacks would be SMALL to MODERATE given current site usage and structures. Rail transportation of coal and lime would likely have SMALL to MODERATE aesthetic impacts, depending on rail traffic routing and noise effects. Plant noise impact would be SMALL given the size and usage of the HNP site.	MODERATE to LARGE	The greatest impacts would be from new transmission lines, plant stacks, and rail lines to transport coal and lime. Impacts range from MODERATE to LARGE depending on the nature of the site.

Impact Category	HNP Site		Alternate Site	
	Impact	Comments	Impact	Comments
Historic and Archeological Resources	SMALL	Most construction would affect previously developed parts of the HNP site; a cultural resource inventory and mitigation measures would minimize any impacts on previously undeveloped lands.	SMALL to MODERATE	An alternate location would necessitate cultural resource studies; construction would likely avoid highly sensitive areas. Impacts likely would be managed or mitigated.
Environmental Justice	SMALL	Impacts on minority and low-income communities would be similar to those experienced by the population as a whole, which are SMALL. Some additional impacts on rental housing may occur during construction, though these likely would not be noticeable.	SMALL to MODERATE	Impacts would vary depending on population distribution and location of the site.

- Water Use and Quality

Surface Water. NRC staff assumes that the coal-fired generation alternative at the HNP site would use the existing cooling tower system and rely on Harris Reservoir for all its water needs. Given the supercritical coal-fired alternative's heat rate, it would use less cooling makeup water than the existing HNP unit, and discharge smaller volumes of tower blowdown to Harris Reservoir. Surface-water impacts would be SMALL, and slightly smaller than the proposed action.

The supercritical coal-fired alternative at an alternate site would likely use a closed-cycle cooling system with cooling towers. For alternate sites, impacts on the surface water would depend on the volume of water needed for makeup volume discharge and the characteristics of the water body. Intake from and discharge to any surface body of water would be regulated by the North Carolina Department of Environment and Natural Resources (NCDENR), Division of Water Quality. These impacts would range from SMALL to MODERATE.

Groundwater. HNP currently uses no groundwater. A coal-fired alternative on the Harris site would likely continue to rely on Harris Reservoir for all water needs. Disposal of coal wastes, however, could have an impact on groundwater resources, especially if onsite disposal results in any leakage to groundwater. NRC staff expects, however, that the wastes would be handled in accordance with state and Federal law. This would keep impacts SMALL.

At an alternate site, impacts to groundwater would depend on the extent to which the plant would utilize groundwater, though NRC finds it unlikely that a coal-fired plant would depend on groundwater for cooling purposes. Given that a plant would likely use groundwater only for domestic and some service purposes, the impact could be SMALL to MODERATE, depending on the nature of the aquifers used.

- Air Quality

The air-quality impacts of coal-fired generation can be substantial and include emissions of sulfur oxides (SO_x), nitrogen oxides (NO_x), particulates, carbon monoxide, hazardous air pollutants such as mercury, and naturally occurring radioactive materials. Many of these pollutants, however, can be effectively controlled by various technologies.

Currently, Wake County and the neighboring counties of Johnston, Chatham, Durham, Franklin and Nash exceed Federal ozone standards, as so are nonattainment areas for ozone under the Clean Air Act (EPA 2007b). These counties are either in attainment or unclassified for other criteria pollutants(5) (EPA 2007b). A new supercritical coal-fired plant located in an ozone nonattainment area would need to purchase emissions credits from existing emitters of ozone-causing chemicals, including NO_x.

A new supercritical coal-fired generating plant located at the HNP site would need a Non-Attainment Area permit and a Title V operating permit under the Clean Air Act. A new coal-fired generating plant would also need to comply with the new source performance standards for coal-fired plants set forth in 40 CFR 60 Subpart D(a). The standards establish limits for particulate matter and opacity (40 CFR 60.42(a)), SO_2 (40 CFR 60.43(a)), and NO_x (40 CFR 60.44(a)). A coal-fired power plant constructed elsewhere in North Carolina or CP&L's territory would need to comply with applicable provisions of the Clean Air Act, as well, based on those areas attainment statuses.

Section 169A of the Clean Air Act (42 USC 7491) establishes a national goal of preventing future and remedying existing impairment of visibility in mandatory Class I Federal areas when impairment results from man-made air pollution. EPA issued a new regional haze rule in 1999 (64 FR 35714) (EPA 1999). The rule specifies that for each mandatory Class I Federal area located within a state, the State must establish goals that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most-impaired days over the period of the implementation plan and ensure no degradation in visibility for the least-impaired days over the same period (40 CFR 51.308(d)(1)). If a coal-fired plant were

(5) Listed criteria pollutants are particulate matter, ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead.

located close to a mandatory Class I area, additional air pollution control requirements would be imposed. North Carolina contains five Class I areas, one of which, Swanquarter Wilderness Area, is potentially downwind of a coal-fired alternative at HNP (EPA 2007a). Swanquarter, however, is approximately 298 km (185 mi) from the HNP site, and thus is unlikely to be affected by a coal-fired alternative. A coal-fired alternative located near Swanquarter or any of North Carolina's other Class 1 Areas may need to install additional emissions controls. EPA more generally protects visibility with regulations in 40 CFR 51, Subpart P.

In addition to Clean Air Act regulations, North Carolina restricts utilities' aggregate emissions of NO_x and SO_x from coal-fired power plants (NC General Statutes 143-215.107D; known as the "Clean Smokestacks Act"). To date, CP&L has met the aims of the legislation by installing emissions controls technologies at older coal-fired plants (NCDENR and NCUC 2006). Constructing a new coal-fired power plant may result in emissions levels that require CP&L to install emissions controls on older coal-fired power plants in order to remain in compliance with the law.

The supercritical coal-fired alternative would produce the following quantities of air pollutants:

Sulfur oxides emissions. This coal-fired alternative at the HNP site would likely use wet, lime-based scrubbers to remove SO_x. EPA indicates that this technology can remove up to 95% of SO_x from flue gases (EPA 1998a). NRC staff projects total SO_x emissions would be 1900 MT (2090 tons) per year.

SO_x emissions from a new coal-fired power plant would be subject to the requirements in Title IV of the Clean Air Act. Title IV was enacted to reduce emissions of SO_2 and NO_x, the two principal precursors of acid rain, by restricting emissions of these pollutants from power plants. Title IV caps aggregate annual power plant SO_2 emissions and imposes controls on SO_2 emissions through a system of marketable allowances. EPA issues one allowance for each ton of SO_2 that a unit is allowed to emit. New units do not receive allowances, but are required to have allowances to cover their SO_2 emissions. Owners of new units must therefore purchase allowances from owners of other power plants or reduce SO_2 emissions at other power plants they own. Allowances can be banked for use in future years. Thus, provided a new coal-fired power plant is able to purchase sufficient allowances to operate, it would not add to net regional SO_2 emissions, although it might do so locally.

North Carolina's Clean Smokestacks Act restricts utility-level aggregate emissions of SO_x from coal-fired power plants. A new coal-fired power plant in North Carolina may result in emissions levels that require CP&L to reduce emissions from other, older power plants.

Nitrogen oxides emissions. This new coal-fired plant would likely use a variety of NO_x-control technologies, including low-NO_x burners, overfire air, and selective catalytic reduction. EPA notes that when these emissions controls are used in concert, they can reduce NO_x emissions by up to 95% (EPA 1998a), for total annual emissions of 577 MT (625 tons).

Section 407 of the Clean Air Act establishes technology-based emission limitations for NO_x emissions. A new coal-fired power plant would be subject to the new source performance standards for such plants as indicated in 40 CFR 60.44a(d)(1). This regulation, issued on September 16, 1998 (63 FR 49453) (EPA 1998b), limits the discharge of any gases that contain nitrogen oxides (expressed as NO_2) in excess of 200 nanograms (ng) per joule (J) of gross energy output (equivalent to 1.6 lb/MWh), based on a 30-day rolling average.

NRC staff estimates that the total annual NO_x emissions for a new coal-fired power plant would be approximately 11.2 percent of the new source performance standard emission rate. As HNP is located in an ozone non-attainment area, the plant operator would need to purchase emissions allowances to offset this amount of emissions.

EPA further restricts the total amount of NO_x that can be emitted on a State level basis. In the 2007 ozone season (May 1–September 30) North Carolina may emit 150,000 MT (165,306 tons) of NO_x. A new coal-fired power plant would need to offset emissions through credit purchases or from a set-aside pool.

North Carolina's Clean Smokestacks Law restricts utility-level aggregate emissions of NO_x from coal-fired power plants. A new coal-fired power plant in North Carolina may result in emissions levels that require CP&L to reduce emissions from other coal-fired power plants.

Particulate emissions. This new coal-fired power plant would use fabric filters or electrostatic precipitators to remove particulates from flue gases. CP&L indicates that these technologies, in concert with emissions controls, would remove 99.9% of particulate matter (Progress Energy 2006b). EPA notes that filters or precipitators are each capable of removing in excess of 99% of particulate matter, and that SO_2 scrubbers further reduce particulate matter emissions (EPA 1998a). As such, NRC staff believes CP&L's removal factor is appropriate. Based on this, the new supercritical coal-fired plant would emit 132 MT (145 tons) of total suspended particulates and approximately 30.3 MT (33.4 tons) of particulate matter having an aerodynamic diameter less than or equal to 10 microns (PM_{10}) (40 CFR 50.6) annually. In addition, coal-handling equipment would introduce fugitive particulate emissions.

During the construction of a coal-fired plant, on-site activities would generate fugitive dust. In addition, vehicles and motorized equipment would create exhaust emissions during the construction process. These impacts would be intermittent and short-lived, however. In addition, to minimize dust generation, construction crews would use applicable dust-control measures.

Carbon monoxide emissions. Based on EPA emission factors (EPA 1998a), NRC staff estimates that the total carbon monoxide emissions would be approximately 567 MT (625 tons) per year.

Hazardous air pollutants including mercury. In December 2000, EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam-generating units (EPA 2000b). EPA determined that coal- and oil-fired electric utility steam-generating units are significant emitters of hazardous air pollutants. Coal-fired power plants were found by EPA to emit arsenic, beryllium, cadmium, chromium, dioxins, hydrogen chloride, hydrogen fluoride, lead, manganese, and mercury (EPA 2000). EPA concluded that mercury is the hazardous air pollutant of greatest concern. EPA found that (1) there is a link between coal consumption and mercury emissions; (2) electric utility steam-generating units are the largest domestic source of mercury emissions; and (3) certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures resulting from consumption of contaminated fish (EPA 2000). Accordingly, on March 15, 2005, EPA issued the Clean Air Mercury Rule to permanently cap and reduce mercury emissions from coal-fired power plants (EPA 2007c). A new coal-fired power plant would need to comply with performance standards contained in 40 CFR 60.45(a), requiring that the plant emit no more than 0.0025 nanograms per Joule output (20×10^{-6} lbs. per MWh). In addition, to the extent the plant would emit any mercury, the plant owners would need to purchase mercury allowances or reduce emissions to ensure that North Carolina emits no more than 1.133 tons of mercury containing gases in 2010, and 0.447 tons of mercury containing gases in 2018 (EPA 2006).

Uranium and thorium. Coal contains uranium and thorium, among other naturally occurring elements. Alex Gabbard, a researcher at Oak Ridge National Laboratory, indicates that uranium concentrations are generally in the range of 1 to 10 parts per million (ppm) and thorium concentrations are generally about 2.5 times this level (Gabbard 1993). The U.S. Geological Survey (USGS) indicates that Western and Illinois Basin coals contain uranium and thorium at roughly equal concentrations, mostly between 1 and 4 ppm, but also indicates that some coals may contain concentrations as high as 20 ppm of both elements (USGS 1997). Gabbard indicates that a 1000 MWe coal-fired plant would release roughly 4.7 MT (5.2 tons) of uranium and 11.6 MT (12.8 tons) of thorium annually (Gabbard 1993). Both USGS and Gabbard indicate that almost all of the uranium, thorium, and most decay products remain in solid coal wastes, especially in the fine glass spheres that constitute much of coal's fly ash. Modern emissions controls, such as those included for this coal-fired alternative, allow for recovery of greater than 99% of these solid wastes (EPA 1998a), thus retaining most of coal's radioactive elements in solid form rather than releasing it to the atmosphere. Even after concentration in coal waste, the level of radioactive elements remains relatively low (typically 10 to 100 ppm) and consistent with levels found in naturally occurring granites, shales, and phosphate rocks (USGS 1997). The level of uranium and thorium contained in coal wastes and disposed of in the environment exceed the levels of uranium and thorium released to the environment by the existing nuclear power plant.

Carbon dioxide. A coal-fired plant would also have unregulated carbon dioxide emissions during operations as well as during coal mining and processing, and coal and lime transportation. Burning bituminous coal in the U.S. emits roughly 205.3 lbs CO_2 per million Btu (Hong and Slatick 1994). The supercritical coal-fired plant would emit approximately 6,320,000 tons of CO_2 per year (5,730,000 MT).

Summary. The GEIS analysis did not quantify emissions from coal-fired power plants, but implied that air impacts would be substantial. The GEIS also mentioned global warming from unregulated carbon dioxide emissions and acid rain from SO_X and NO_X emissions as potential impacts (NRC 1996). The above analysis shows that emissions of air pollutants, including SO_X, NO_X, carbon monoxide, and particulates, exceed those produced by the existing nuclear power plant, as well as those of the other alternatives considered in this section. Operational emissions of carbon dioxide are also much greater under the coal-fired alternative.(6)

Adverse human health effects such as cancer and emphysema have also been associated with air emissions from coal combustion. NRC analysis for a coal-fired alternative at the HNP site and an alternative site indicates that impacts from the coal-fired alternative would have clearly noticeable effects, but given existing regulatory regimes, permit requirements, and emissions controls, the coal-fired alternative would not destabilize air quality. Thus, the appropriate characterization of air impacts from coal-fired generation would be MODERATE.

Siting a coal-fired generation plant at a site other than HNP would not significantly change air-quality impacts, although it would result in installing more- or less-stringent pollution-control equipment to meet applicable local requirements, or cause the plant's owner to more- or less-actively participate in various emissions trading schemes. Impacts to air quality at an alternate site would be MODERATE.

- Waste

Coal combustion generates waste in the form of ash, and emissions controls collect additional ash while converting gaseous pollutants to liquid or semisolid sludge. Two 439.5-MWe, net, coal-fired units would generate approximately 357,000 MT (393,000 tons) of this waste annually for 40 years. Of this waste, approximately 108,000 MT (119,000 tons) (41% of the ash content) would be recycled, according to CP&L, leaving a total of

(6) Table S-3 in 10 CFR 51.51 indicates that electrical energy consumed during the uranium fuel cycle to supply a 1000 MWe is equivalent to the electricity produced by a 45 MWe coal-fired power plant.

approximately 249,000 MT (274,000 tons) that would be landfilled onsite. This waste would require approximately 59.9 ha (148 ac) of land area over the 40-year plant life (assuming a waste pile 9.15 m [30.0 ft] high). As mentioned in the air quality section, this waste would also contain levels of uranium and thorium in concentrations similar to those found in naturally occurring granites, shales, and phosphate rocks (USGS 1997). In addition to coal combustion wastes, a supercritical coal-fired alternative would also produce small amounts of domestic and hazardous wastes.

Waste impacts to groundwater and surface water would extend beyond the operating life of the plant if leaching and runoff from the waste storage area makes way into groundwater or surface water. Disposal of the waste would noticeably affect land use and groundwater quality if not properly managed, but with appropriate management and monitoring, effects on groundwater water resources would be prevented. After closure of the waste site and revegetation, the land would be available for other uses. Waste impacts from operating this coal-fired alternative, then, are MODERATE, as waste impacts would be noticeable, but they would not destabilize any resources.

Debris would be generated during construction activities. These would likely be disposed onsite, when possible. Overall, this amount of waste would be small compared to operational waste generated, and many construction wastes can be recycled. As such, construction-stage waste impacts would be SMALL.

For all of the preceding reasons, the appropriate characterization of impacts from waste generated by the supercritical coal-fired alternative would be MODERATE; the impacts would be clearly noticeable, but would not destabilize any important resource.

Siting the facility at a site other than HNPS would not alter waste generation, although other sites might have more constraints on disposal locations. If a coal facility was sited on a previously developed location, then there may also be fewer constraints on waste disposal, but the overall impact level would not likely change. Therefore, the impacts would remain MODERATE.

- Human Health

Coal-fired power generation introduces worker risks from coal and limestone mining, from coal and lime transportation, and from disposal of coal combustion waste. In addition there are public risks from inhalation of stack emissions. Emission impacts can be widespread and health risks difficult to quantify. The coal-fired alternative also introduces the risk of coal-pile fires and attendant inhalation risks.

Regulatory agencies, including EPA and State agencies, set air emission standards and requirements based on human health impacts. These agencies also impose site-specific emission limits as needed to protect human health. As discussed previously, EPA has concluded that certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures from sources such as coal-fired power plants and has taken action to address mercury emissions from coal-fired power plants. In the absence of more quantitative data, human health impacts from radiological doses and inhaling toxins and particulates generated by burning coal would be characterized as SMALL.

- Socioeconomics

Construction of the supercritical coal-fired alternative would take approximately 4 years (DOE/EIA 2006b). The NRC staff assumed that construction would take place while HNP continues operation and would be completed by the time it permanently ceases operations in 2026. The construction work force would be expected to include up to 2340 workers (NRC 1996). These workers would be in addition to the approximately 720 workers currently employed at HNP. During construction, the surrounding communities would experience an increased demand for rental housing and public services, though this would be moderated by the proximity of the site to urban areas. After construction, the communities may be affected by the loss of construction jobs, though this would likely be offset by the area's rapid growth.

If the coal-fired replacement plant were constructed at the HNP site and HNP were to be decommissioned, the area would experience a loss of approximately 486 permanent high-paying jobs (from 720 employees for HNP to 234 for the coal-fired plant), with a commensurate, relatively minor reduction in demands on socioeconomic resources and tax contributions to the regional economy. The coal-fired plant would provide a new tax base to offset the loss of tax base associated with decommissioning of the HNP unit in Wake County. Other counties would likely experience little impact, as HNP pays 90% of its local taxes to Wake County. Since the region's growing economy effectively mitigates most socioeconomic impacts of both construction and operation, the appropriate characterization of non-transportation socioeconomic impacts for a coal-fired plant constructed at the HNP site would be SMALL to MODERATE.

During the 4-year construction period of replacement coal-fired units, up to 2340 construction workers would be commuting to the site in addition to the current 720 workers at HNP. The addition of these workers would increase traffic loads on existing highways, particularly on surface roads in and around the plant. Given that the area has good access to highways, however, these impacts would be SMALL to MODERATE. Transportation-related impacts associated with commuting construction workers at an alternate site are site dependent, but would be SMALL to LARGE. Transportation impacts related to commuting of plant operating personnel would also be site dependent, but would be characterized as SMALL to MODERATE.

For transportation related to commuting of plant operating personnel, the impacts would be considered SMALL. The maximum number of plant operating personnel would be approximately 234 compared to the current HNP work force of 720. Therefore, traffic impacts associated with plant personnel commuting to a coal-fired plant would be expected to be SMALL, and smaller than the impacts of HNP license renewal.

For rail transportation related to coal and lime delivery to the HNP site, the impacts would be SMALL, depending on coal train routes. Approximately 250 coal unit trains per year (each with 100 cars carrying 100 tons of coal each) would be needed to deliver the coal and lime for the two coal-fired units. A total of 10 train trips would be expected per week, or nearly 2 trips per day on the spur leading to the plant, because for each full train delivery there would be an empty train returning from the plant. At an alternate site, coal and lime would likely be delivered by rail as well. Transportation impacts would depend upon the site location. Socioeconomic impacts associated with rail transportation would be SMALL. Socioeconomic impacts associated with rail transportation on a previously developed site would be SMALL.

Construction of a supercritical coal-fired power plant at an alternate site would relocate some socioeconomic impacts, but would not eliminate them. The communities around HNP would experience relatively minor impacts of HNP operational job loss, and the communities around the new site would have to absorb the impacts of a large, temporary work force (up to 2340 workers at the peak of construction) and a permanent work force of approximately 234 workers. In the GEIS, the NRC staff stated that socioeconomic impacts at a rural site would be larger than at an urban site, because more of the peak construction work force would need to move to the area to work. The HNP site is in the Raleigh-Durham-Chapel Hill metropolitan area and is therefore not considered a rural site. Alternate sites would need to be analyzed on a case-by-case basis. Alternate industrial sites, however, tend to be close to metropolitan areas, and may still have remaining transportation infrastructure nearby. Socioeconomic impacts at a rural site would be LARGE, while impacts at previously developed industrial site would be SMALL to MODERATE.

- Aesthetics

If sited at the current HNP location, the coal-fired power plant units would be as much as 60 m (200 ft) tall and would likely not be visible offsite due to extensive forestation. The two exhaust stacks would be somewhere in the range of 120 to 185 m (400 to 600 ft) high and would be visible offsite for many miles. Given the current presence of a cooling tower and its plumes, as well as other plant structures on-site, the addition of plant stacks would not drastically increase visual impacts. These would be noticeable, but would not likely destabilize the resource. The units and associated stacks would also be visible at night because of outside lighting. Visual impacts of a new coal-fired plant could be mitigated by landscaping and color selection for buildings that is consistent with the environment. Visual impact at night could be mitigated by reduced lighting where possible and appropriate shielding. Overall, the addition of a coal-fired unit and the associated stack at the HNP site would likely have a SMALL to MODERATE aesthetic impact.

Coal-fired generation would introduce mechanical sources of noise that would be audible offsite, although given the low population near the plant's property, offsite noise is unlikely to be obtrusive. Sources contributing to total noise produced by plant operation would be classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the equipment related to coal handling, solid-waste disposal, transportation related to coal and lime delivery, use of outside loudspeakers, and the commuting of plant employees. The incremental noise impacts of a coal-fired plant compared to existing HNP operations would be SMALL.

Noise impacts associated with rail delivery of coal and lime to a plant at the HNP site would be most significant for residents living in the vicinity of the facility and along the rail route. Although noise from passing trains significantly raises noise levels near the rail corridor, the short duration of the noise reduces the impact. Given the frequency of train transport and the potential for many residents within hearing distance of the rail route, the impacts of noise would be SMALL to MODERATE, depending on train routes.

At an alternate site, plant buildings, exhaust stacks, cooling towers, and cooling tower plumes would create aesthetic impacts. There would also be an aesthetic impact associated with construction of a new transmission line to connect to other lines to enable delivery of electricity. Noise and light from the plant would be detectable offsite. Aesthetic impacts at the plant site would be mitigated if the plant were located in an industrial area adjacent to other power plants or industrial facilities. Noise impacts from a rail spur, if required, would be similar to the impacts at the existing site. Overall the aesthetic impacts associated with locating at an alternate site would be categorized as MODERATE to LARGE. Some of these issues would be rectified if the coal plant was sited at a previously developed site, as many contain some level of rail infrastructure, and would be in areas previously developed for industrial uses. Impacts at a previously developed site would be SMALL to MODERATE.

- Historic and Archaeological Resources

At the HNP site or an alternate site, a cultural resource inventory would be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before beginning construction at an alternate site, surveys would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would likely be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission corridors, rail lines, or other rights-of-way).

Historic and archaeological resource impacts can generally be effectively managed and as such would be considered SMALL for the existing site and likely SMALL to MODERATE at a new site. For a previously developed site, most of which have already been intensively developed, impact on cultural and historic resources would also be SMALL. Previous development would likely have either removed or surveyed items of archaeological interest.

- Environmental Justice

No environmental impacts were identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement coal-fired plant were built at the HNP site. Some impacts on rental and other temporary housing availability and lease prices during construction might occur, and this could disproportionately affect the minority and low-income populations.

Impacts on minority and low-income populations due to the shutdown of HNP would depend on the number of jobs and the amount of tax revenue lost to the communities surrounding the power plant. Closure of HNP would reduce the overall number of jobs and tax revenue generated in the region that was directly and indirectly attributed to plant operations. However, given the rapid economic growth of Wake County and the Raleigh-Durham area, it is likely that these losses would be replaced by the development of new businesses and new sources of tax revenue in the region. Since CP&L's tax payments represent a small percentage of Wake County's total annual property tax revenue, it is unlikely that social services would be seriously affected. Therefore, minority and low-income populations in the vicinity of HNP would not likely experience any disproportionately high and adverse socioeconomic impacts from the shutdown of HNP.

The environmental effect of plan shutdown would reduce the amount of operational impacts on the environment. Therefore, minority and low-income populations in the vicinity of HNP would not likely experience any disproportionately high and adverse environmental impacts from the shutdown of HNP.

Impacts at other sites would depend upon the site chosen and the nearby population distribution, but would be SMALL to MODERATE for alternate sites. For previously developed industrial sites, impacts would be slightly larger, depending on where low-income populations are located.

8.2.2 Coal-Fired Integrated Gasification Combined-Cycle (IGCC) Generation

The second coal-fired option considered by NRC as an alternative to HNP license renewal is an integrated gasification combined-cycle (IGCC) plant. IGCC plants operate very differently from conventional coal plants, and were not considered by NRC staff in the GEIS. An IGCC coal-fired plant first heats coal in a gasifier with carefully controlled amounts of water and oxygen. The resulting gas stream (called synthesis gas, or syngas) contains primarily carbon monoxide and hydrogen. Most coal impurities remain in gasifier waste material, called slag, while gasifiers convert sulfur-containing compounds to either elemental sulfur or sulfuric acid, both of which can be marketed as commodities. Gaseous pollutants, mercury among them, can be removed from the syngas stream prior to combustion. Following gasification and pollutant removal, the gas stream travels to a conventional combined-cycle power plant, similar in construction to a natural-gas-fired combined-cycle power plant. First, the gas stream burns in a combustion turbine. Then, the still-hot gas mixture gives up most of the remaining heat to water in a heat recovery steam generator. While IGCC plants can theoretically achieve thermal efficiencies approaching 50% (DOE/EIA 2006a), the technology is still relatively young from a utility-scale commercial perspective. No IGCC plant with a capacity as large as HNP has yet been constructed in the U.S., though NRC staff notes considerable utility interest in this technology for the ability to effectively reduce emissions of many air pollutants as well as to potentially produce a separate carbon dioxide stream for eventual sequestration. Given IGCC's limited commercial implementation in the U.S., EPA has not yet developed detailed emissions factors for the technology. In general, NRC staff has adopted emissions factors from DOE (DOE 1999) as cited in the HNP ER in order to characterize emissions from the IGCC coal-fired alternative.

In the HNP ER, CP&L adopts a heat rate of 6870 BTU/kWh for an IGCC coal-fired alternative. NRC staff notes that this heat rate is significantly lower than the 8309 Btu/kWh reported by EIA for forecasting purposes (DOE/EIA 2006a). NRC staff will adopt EIA's assumed heat rate for this analysis, as it more-closely approximates existing IGCC plants (e.g., Tampa Electric Company's Polk Plant and the Wabash River Coal Gasification Repowering Project; see DOE 2004 and DOE 2000). CP&L's analysis assumed three gas turbine units each with net outputs of 293 MWe each (nearly 326 MWe gross output assuming 10% onsite power consumption; this level of onsite consumption is consistent with experience at the Wabash River site) (DOE 2000).

Although the operating license renewal period is only 20 years, NRC staff analyzed the impact of operating the IGCC coal-fired alternative for 40 years, as this may be a reasonable projection of the operating life of an IGCC coal-fired plant and is consistent with the analysis NRC staff conducted for the supercritical coal-fired alternative.

The IGCC coal-fired plant, with a gross output of 977 MWe, would consume approximately 2.23 million MT (2.45 million tons) per year of pulverized bituminous coal with an ash content of approximately 11.6 percent based on averages for North Carolina coal consumption (EIA/DOE 2006c). In an IGCC coal-fired-plant, the gasifier consolidates solid waste in vitrified slag, instead of producing ash as in a coal-fired boiler. For HNP, the IGCC coal-fired alternative would produce approximately 258,000 MT (285,000 tons) of slag and 19,200 MT (21,200 tons) of elemental sulfur in a year. CP&L indicated that the elemental sulfur as well as 90% of slag would be marketed. Based on IGCC's ability to remove wastes prior to syngas combustion, CP&L also indicated that no additional scrubbing of exhaust streams would be necessary (Progress Energy 2006b).

At the HNP site, coal would likely be delivered by rail, while slag and sulfur for reuse would likely be removed by rail or by truck. The IGCC coal fired option would likely require approximately 245 100-car unit trains per year, or roughly 5 trains or 10 trips per week. As such, the existing rail spur would need to be improved to allow for these deliveries. Impacts from improving the rail spur would be SMALL, as the spur already exists and is currently used for industrial purposes.

For purposes of this section, the NRC staff assumed that an IGCC coal-fired plant located at either the HNP site or an alternate site would use a closed-cycle cooling system, as the current HNP unit does. CP&L did not analyze an alternate site for an IGCC coal-fired plant in the ER.

The NRC staff discusses the overall impacts of the IGCC coal-fired generating system in the following sections and summarizes the analysis in Table 8-3. The extent of impacts at an alternate site would depend on the location of the particular site selected.

- Land Use

  The existing facilities and infrastructure at the HNP site would be used to the extent practicable, limiting the amount of new construction necessary. A new IGCC coal-fired plant may be able to use the existing cooling tower system, switchyard, offices, and transmission line rights-of-way. Much of the land that would be used has been previously disturbed. As noted above, a coal-fired plant on-site would require improvements to the existing rail line in order to support coal and lime deliveries.

  NRC noted in the GEIS (NRC 1996) that a 1000 MW coal-fired alternative would necessitate converting approximately 700 ha (1700 ac) of land to industrial uses. NRC staff recognizes that, as IGCC plants tend to be more mechanically similar to gas-fired power plants than to coal-fired power plants. Therefore, the amount of land conversion required by a conventional coal plant is likely greater than the IGCC alternative would require. In addition, NRC staff recognizes that some amount of existing HNP auxiliary structures, like offices and parking lots, as well as intake and cooling tower systems, would also be used by the IGCC alternative. NRC staff thus indicates that the IGCC alternative would likely require several hundred acres, but fewer than the supercritical coal-fired alternative (Progress Energy indicated that the IGCC option would require 80.9 ha [200 ac], which is 20.2 ha [50 ac] fewer than the conventional coal alternative) (Progress Energy 2006b).

Additional land-use changes would occur offsite in an undetermined coal-mining area to supply coal for the plant. Assuming a mix of coal supply similar to North Carolina's current coal supply, this land disturbance would likely occur mostly in West Virginia (EIA/DOE 2006c). In the GEIS, the NRC staff estimated that approximately 8900 ha (22,000 ac) would be affected for mining the coal and disposing of the waste to support a 1000 MWe coal plant during the operational life. An IGCC coal-fired alternative to replace HNP would thus require approximately 8700 ha (21,500 ac) of land, 4.37 ha (10.8 ac) of which the plant would use for onsite slag disposal over the 40-year life. Coal mining would likely take place in existing coal-mining regions and in accordance with applicable mining regulations. Partially offsetting this offsite land use would be the elimination of the need for uranium mining to supply fuel for HNP. In the GEIS, the NRC staff estimated that approximately 400 ha (1000 ac) would be affected for mining the uranium and processing it during the operating life of a 900 MW nuclear power plant.

As mentioned earlier, while the existing rail spur could be used to deliver coal to the site, it would be likely that the spur would require improvements to support the significant increase in traffic involved in servicing the IGCC.

The impact of an IGCC coal-fired generating unit on land use located at the existing HNP site would be best characterized as MODERATE, and would be greater than the proposed action.

Construction of the IGCC coal-fired generation alternative at an alternate site would impact significantly more than 80.9 ha (200 ac) for plant and auxiliary structures, as well as tens to thousands of acres for transmission lines and a rail spur. Waste disposal would require 4.37 ha (10.8 ac). An IGCC alternative at a different site would also require approximately 8700 ha (21,500 ac) for coal mining. Thus, impacts would range from MODERATE to LARGE, depending on length of transmission line corridors and the rail spur.

- Ecology

Locating an IGCC coal-fired plant at the HNP site would affect ecological resources, but existing site maintenance practices and the site's industrial nature would minimize additional impacts from the new plant. Given the IGCC plant's easily-marketed waste streams, impacts from onsite waste disposal are smaller than for the supercritical coal-fired plant. Impacts to terrestrial ecology would be SMALL to MODERATE. At an alternate site, constructing transmission lines and a rail spur would incur additional impacts, along with the land used to construct plant facilities and infrastructure. These impacts would be MODERATE to LARGE.

Aquatic ecology impacts would be smaller than the impacts of the HNP unit, as the lower heat rate of the IGCC coal-fired option means less water would be consumed for cooling.

The on-site option would make use of the existing plant's cooling, intake, and outflow structures. Since the existing HNP unit already has a SMALL impact on aquatic ecology, and the IGCC alternative has a smaller impact, the impact level remains SMALL. An IGCC coal-fired plant at an alternate site would likely also make use of cooling towers, and would incur similar aquatic impacts, which would range from SMALL to MODERATE, depending on the characteristics of the water body used for cooling.

Table 8-3. Summary of Environmental Impacts of IGCC Coal-Fired Generation at HNP Site and an Alternate Site Using Closed-Cycle Cooling

Impact Category	HNP Site		Alternate Site	
	Impact	**Comments**	**Impact**	**Comments**
Land Use	MODERATE	May use 80.9 ha (200 ac) for plant structures and 4.37 ha (10.8 ac) for waste disposal; impact would be less than the supercritical coal-fired alternative; additional offsite land impacts for coal mining.	MODERATE to LARGE	Uses several hundred acres for plant, offices, parking, and plant facilities. Transmission line, rail spur, and coal mining require additional land.
Ecology	SMALL to MODERATE	Uses undeveloped areas at current HNP site, plus existing rail and transmission corridors.	MODERATE to LARGE	Impacts depend on the location and ecology of the site, characteristics of the surface water body used for intake and discharge, and transmission line and rail routes. Construction may result in habitat loss and fragmentation; reduced productivity and biological diversity.
Water Use and Quality—Surface Water	SMALL	Uses existing cooling tower system, and uses less water than the existing HNP.	SMALL to MODERATE	With closed-cycle cooling, impact likely to be SMALL, though it would depend on the volume of water withdrawn and discharged, as well as the characteristics of the surface water body.
Water Use and Quality—Groundwater	SMALL	A new plant onsite would likely continue to rely on Harris Reservoir for all water. NRC staff expects groundwater impacts only if coal slag contaminates groundwater.	SMALL to MODERATE	Impact would depend on the volume of water withdrawn and discharged and the characteristics of the aquifers, though NRC staff assumes groundwater would not be used for cooling makeup water.

Impact Category	HNP Site		Alternate Site	
	Impact	Comments	Impact	Comments
Air Quality	MODERATE	• Sulfur oxides 466 MT/yr (514 tons/yr) • Nitrogen oxides 658 MT/yr (725 tons/yr) • Total suspended particulates 52.1 MT/yr (57 tons/yr) • PM_{10} 52.1 MT/yr (57 tons/yr) • Carbon monoxide 822 MT/yr (906 tons/yr) • Mercury removed by syngas-stage controls	MODERATE	Potentially the same impacts as at the HNP site, although pollution-control standards may vary.
Waste	SMALL	Total slag disposed onsite would be approximately 25,800 MT (28,500 tons) per year, since most slag, 232,000 MT/yr (256,000 tons/yr), would be reused. Over the plant's lifespan, 4.37 ha (10.8 ac) would be required for waste disposal.	SMALL to MODERATE	Same impacts as at the HNP site; waste disposal constraints may vary.
Human Health	SMALL	Impacts are uncertain, but considered SMALL as the plant would comply with health-informed standards in the Clean Air Act and other relevant emissions regulations.	SMALL	Similar impacts as at the HNP site.

Impact Category	HNP Site		Alternate Site	
	Impact	Comments	Impact	Comments
Socioeconomics	SMALL to MODERATE	During construction, impacts would be MODERATE. Between 1170 and 2440 workers during the peak period of the 4-year construction period, followed by reduction from current HNP work force of 720 to between 147 and 244 workers. Tax base would generally be preserved in Wake County. Impacts during operation would be SMALL.	SMALL to LARGE	Construction impacts depend on location, but would be LARGE if the plant is located in an area that is rural or is growing less quickly than areas near the HNP site. Wake and surrounding counties may lose tax revenue and employment, though economic growth would likely offset much of this loss. Impacts at a site near to an urban area may be SMALL.
Socioeconomics (Transportation)	SMALL to MODERATE	Transportation impacts would be SMALL to MODERATE, primarily due to construction activities. For rail transportation of coal and lime, the impact would likely be SMALL, depending on the routing of coal trains.	SMALL to LARGE	Transportation impacts would be SMALL to LARGE, primarily due to construction activities. For rail transportation of coal, the impact would be SMALL, but dependent on the routing of coal trains.
Aesthetics	SMALL to MODERATE	Aesthetic impact due to plant units and stacks would be SMALL. Rail transportation of coal would have a SMALL to MODERATE aesthetic impact. Noise impact would be SMALL given the size of the site.	SMALL to LARGE	Overall impacts could vary widely, with the greatest impacts from new transmission lines, rail lines to transport coal, and cooling towers.
Historic and Archeological Resources	SMALL	Some construction would affect previously developed parts of the HNP site; cultural resource inventory would minimize any impacts on undeveloped lands.	SMALL to MODERATE	Alternate location would necessitate cultural resource studies; construction would likely avoid highly sensitive areas. Impacts would be managed.

Impact Category	HNP Site		Alternate Site	
	Impact	Comments	Impact	Comments
Environmental Justice	SMALL	Impacts on minority and low-income communities would be similar to those experienced by the population as a whole. Some impacts on rental housing may occur during construction; loss of 476 to 573 operating jobs could reduce employment prospects for minority and low-income populations, though this would likely be offset by economic growth.	SMALL to MODERATE	Impacts would vary depending on population distribution and location of the site.

- Water Use and Quality

Surface Water. The IGCC coal-fired generation alternative at the HNP site is assumed to use the existing cooling tower system, which would minimize incremental water-use and quality impacts. Given the IGCC coal plant's heat rate, it would likely use less water than the existing HNP unit. As such, impacts to surface water use and quality would be SMALL.

Alternate sites would likely use a closed-cycle cooling system with cooling towers. For alternate sites, the impact on the surface water would depend on the volume of water needed for makeup water, the discharge volume, and the characteristics of the water body used for intake and discharge. Intake from and discharge to any surface body of water would be regulated by NCDENR. The impacts would be SMALL to MODERATE.

Groundwater. HNP uses no groundwater. An IGCC coal-fired alternative on the HNP site would likely continue to rely on Harris Reservoir for all water needs and not use any groundwater. Provided operators properly landfill leftover slag, the impact to groundwater would be SMALL.

At an alternate site, impacts to groundwater would depend on the extent to which the plant utilizes groundwater, though NRC finds it unlikely that a coal-fired IGCC plant would depend on groundwater for cooling purposes. Given that a plant would likely use groundwater only for domestic and some service purposes, the impact could be SMALL to MODERATE, depending on the nature of the aquifers used.

- Air Quality

The air-quality impacts of IGCC coal-fired generation can be substantial, though markedly less than conventional coal technologies in several important areas. These include lower emissions of mercury as well as particulate matter. Pre-scrubbed levels of sulfur oxides (SO_x) and nitrogen oxides (NO_x) are also typically much lower than conventional coal technologies. In addition, naturally occurring radioactive materials would likely remain in slag much as they remain in solid ash products in conventional coal plants.

Currently, Wake County and the neighboring counties of Johnston, Chatham, Durham, Franklin and Nash are ozone nonattainment areas under the Clean Air Act (EPA 2007b). These counties are either in attainment or unclassified for other criteria pollutants (EPA 2007b). A new IGCC coal-fired plant located in an ozone non-attainment area would need to purchase emissions credits from existing emitters of ozone-causing chemicals, including NO_x.

A new IGCC coal-fired generating plant located at the HNP site would also need a Nonattainment Area permit and a Title V operating permit under the Clean Air Act. A new coal-fired generating plant located at an alternate site would also need to comply with the new source performance standards for coal-fired plants set forth in 40 CFR 60 Subpart D(a). The standards establish limits for particulate matter and opacity (40 CFR 60.42(a)), SO_2 (40 CFR 60.43(a)), and NO_x (40 CFR 60.44(a)). A coal-fired power plant constructed elsewhere in North Carolina or CP&L's territory would need to comply with applicable provisions of the Clean Air Act, as well, based on those areas attainment statuses.

Section 169A of the Clean Air Act (42 USC 7491) establishes a national goal of preventing future and remedying existing impairment of visibility in mandatory Class I Federal areas when impairment results from man-made air pollution. EPA issued a new regional haze rule in 1999 (64 FR 35714) (EPA 1999). The rule specifies that for each mandatory Class I Federal area located within a state, the State must establish goals that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most-impaired days over the period of the implementation plan and ensure no degradation in visibility for the least-impaired days over the same period (40 CFR 51.308(d)(1)). If a coal-fired plant were located close to a mandatory Class I area, additional air pollution control requirements would be imposed. North Carolina contains five Class I areas, one of which, Swanquarter Wilderness Area, is potentially downwind of a coal-fired alternative at HNP (EPA 2007a). Swanquarter, however, is approximately 298 km (185 mi) from the HNP site, and thus is unlikely to be affected by a coal-fired alternative. A coal-fired alternative located near Swanquarter or any of North Carolina's other Class 1 Areas may need to install additional emissions controls. EPA more generally protects visibility with regulations in 40 CFR 51, Subpart P.

In addition to Clean Air Act regulations, North Carolina restricts utilities' aggregate emissions of NO_x and SO_x from coal-fired power plants (NC General Statutes 143-215.107D; commonly known as the Clean Smokestacks Act). To date, Progress Energy has met the aims of the legislation by installing emissions controls technologies at older coal-fired plants (NCDENR and NCUC 2006). Constructing a new IGCC coal-fired power plant may result in emissions levels that require CP&L to install emissions controls on older coal-fired power plants in order to remain in compliance with the law.

The IGCC coal-fired alternative would produce the following quantities of air pollutants:

Sulfur oxides emissions. DOE indicated that a coal-fired IGCC plant would emit 0.0077 kg (0.017 lb) of SO_x per million BTU of thermal input (DOE 1999). Based on this emissions rate, NRC staff projects total SO_2 emissions are of 466 MT (514 tons) per year without any additional emissions control technology.

A new coal-fired power plant would be subject to the requirements in Title IV of the Clean Air Act. Title IV was enacted to reduce emissions of SO_2 and NO_x, the two principal precursors of acid rain, by restricting emissions of these pollutants from power plants. Title IV caps aggregate annual power plant SO_2 emissions and imposes controls on SO_2 emissions through a system of marketable allowances. EPA issues one allowance for each ton of SO_2 that a unit is allowed to emit. New units do not receive allowances, but are required to have allowances to cover their SO_2 emissions. Owners of new units must therefore purchase allowances from owners of other power plants or reduce SO_2 emissions at other power plants they own. Allowances can be banked for use in future years. Thus, a new coal-fired power plant would not add to net regional SO_2 emissions, although it might do so locally.

North Carolina's Clean Smokestacks Law restricts utility-level aggregate emissions of SO_x from coal-fired power plants. A new coal-fired power plant in North Carolina may result in emissions levels that require CP&L to reduce emissions from other, older power plants.

Nitrogen oxides emissions. In the absence of additional control technologies, the IGCC alternative would produce 658 MT (725 tons) of NO_x per year, based on DOE emissions projections (DOE 1999).

Section 407 of the Clean Air Act establishes technology-based emission limitations for NO_x emissions. The market-based allowance system used for SO_2 emissions is not used for NO_x emissions. A new coal-fired power plant would be subject to the new source performance standards for such plants as indicated in 40 CFR 60.44a(d)(1). This regulation, issued on September 16, 1998 (63 FR 49453) (EPA 1998b), limits the discharge of any gases that contain nitrogen oxides (expressed as NO_2) in excess of 200 ng/J of gross energy output (1.6 lb/MWh), based on a 30-day rolling average.

Even without additional control technologies, NRC staff estimates that the total annual NO_X emissions for a new coal-fired power plant would be approximately 658 MT/yr (725 tons/yr) or approximately 12.4 percent of the new source performance standard emission rate. This level of NO_X emissions would be greater, however, than the operating license renewal alternative.

EPA further restricts the total amount of NO_X that can be emitted on a State level basis. In the 2007 ozone season (May 1–September 30) North Carolina may emit 150,000 MT (165,306 tons) of NO_X. A new IGCC coal-fired power plant would need to offset emissions through credit purchases or from a set-aside pool.

North Carolina's Clean Smokestacks Law restricts utility-level aggregate emissions of NO_X from coal-fired power plants. A new IGCC power plant in North Carolina may result in emissions levels that require CP&L to reduce emissions from other coal-fired power plants.

Particulate emissions. NRC staff estimates that the total annual stack emissions would include approximately 52.1 MT (57 tons) of filterable total suspended particulates, all of which have an aerodynamic diameter less than or equal to 10 μm (PM_{10}) (40 CFR 50.6). In addition, coal-handling equipment would introduce fugitive particulate emissions. Particulate emissions would be greater under the coal alternative than the operating license renewal alternative.

During the construction of an IGCC coal-fired plant, fugitive dust would be generated. In addition, exhaust emissions would come from vehicles and motorized equipment used during the construction process. These impacts are intermittent and short-lived. To minimize dust generation, construction crews would use applicable dust-control measures..

Carbon monoxide emissions. In the absence of DOE or EPA emissions data, NRC staff adopts CP&L's emissions rate, which indicates that the total carbon monoxide emissions would be approximately 822 MT (906 tons) per year. This level of emissions would be greater than the operating license renewal alternative.

Hazardous air pollutants including mercury. In December 2000, EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam-generating units (EPA 2000b). EPA determined that coal- and oil-fired electric utility steam-generating units are significant emitters of hazardous air pollutants. Coal-fired power plants were found by EPA to emit arsenic, beryllium, cadmium, chromium, dioxins, hydrogen chloride, hydrogen fluoride, lead, manganese, and mercury (EPA 2000b). EPA concluded that mercury is the hazardous air pollutant of greatest concern. EPA found that (1) there is a link between coal consumption and mercury emissions; (2) electric utility steam-generating units are the largest domestic source of mercury emissions; and (3) certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures resulting from consumption of contaminated fish (EPA 2000b). Accordingly, EPA added coal- and oil-fired electric utility steam-generating units to the list of source categories under Section 112(c) of the Clean Air Act for which emission standards for hazardous air pollutants will be issued (EPA 2000b). Accordingly, on March 15, 2005, EPA issued the Clean Air Mercury Rule to permanently cap and reduce mercury emissions from coal-fired power plants (EPA 2007c). A new IGCC coal-fired power plant would need to comply with performance standards contained in 40 CFR 60.45(a), requiring that the plant emit no more than 0.0025 nanograms per Joule output (20 x 10^{-6} lbs. per MWh). In addition, to the extent the plant would emit any mercury, the plant owners would need to purchase mercury allowances or reduce emissions to ensure that North Carolina emits no more than 1.133 tons of mercury containing gases in 2010, and 0.447 tons of mercury containing gases in 2018 (EPA 2006).

IGCC units minimize mercury emissions by allowing control technologies to extract mercury from syngas prior to combustion in the combined-cycle power plant.

Uranium and thorium. Coal contains uranium and thorium, among other naturally occurring elements. Alex Gabbard, a researcher at Oak Ridge National laboratory, indicates that uranium concentrations are generally in the range of 1 to 10 parts per million (ppm) and thorium concentrations are generally about 2.5 times this level (Gabbard 1993). The USGS indicates that Western and Illinois Basin coals contain uranium and thorium at roughly equal concentrations, mostly between 1 and 4 ppm, but also indicates that some coals may contain concentrations as high as 20 ppm of both elements (USGS 1997). Gabbard indicates that a 1000 MWe coal-fired plant would release roughly 4.7 MT (5.2 tons) of uranium and 11.6 MT (12.8 tons) of thorium annually (Gabbard 1993). Both USGS and Gabbard indicate that almost all of the uranium, thorium, and most decay products remain in solid coal wastes, especially in the fine glass spheres that constitute much of coal's fly ash. Modern emissions controls allow for recovery of greater than 99% of these solid wastes (EPA 1998a), thus retaining most of coal's radioactive elements in solid form rather than releasing it to the atmosphere. In an IGCC plant, uranium and thorium would remain in slag material. Even after concentration in coal slag, the level of radioactive elements remains relatively low (typically 10 to 100 ppm) and consistent with levels found in naturally occurring granites, shales, and phosphate rocks (USGS 1997). The level of uranium and thorium contained in coal wastes and disposed of in the environment exceed the levels of uranium and thorium released to the environment by the existing nuclear power plant.

Carbon dioxide. A coal-fired IGCC plant would also have unregulated carbon dioxide emissions during operations of the plant itself as well as during coal mining and processing, as well as coal transportation. Burning bituminous coal in the U.S. emits roughly 205.3 lbs CO_2 per million Btu (Hong and Slatick 1994). The IGCC plant would emit approximately 6,200,000 tons of CO_2 per year (5,630,000 MT)

Summary. The GEIS analysis did not quantify emissions from coal-fired power plants, but did imply that air impacts would be substantial. The GEIS also mentioned global warming from unregulated carbon dioxide emissions and acid rain from SO_X and NO_X emissions as potential impacts (NRC 1996). Adverse human health effects such as cancer and emphysema have been associated with the products of coal combustion. NRC staff analysis for an IGCC coal-fired alternative at the HNP site and an alternative site indicates that impacts from the coal-fired alternative would have clearly noticeable effects, but would not destabilize air quality. Thus, the appropriate characterization of air impacts from coal-fired generation would be MODERATE.

Siting an IGCC coal-fired generation plant at a site other than HNP would not significantly change air-quality impacts, although it would result in installing more or less stringent pollution-control equipment to meet applicable local requirements. Therefore, the impacts would be MODERATE.

- Waste

IGCC combustion of coal generates waste in slag, a vitreous, sand-like material. The IGCC alternative would generate 258,000 MT (285,000 tons) of slag annually for 40 years. Of this waste, approximately 232,000 MT (256,000 tons) (90%) would be recycled, according to CP&L, leaving a total of approximately 25,800 MT (28,500) tons that would be landfilled onsite. Slag disposal would require 4.37 ha (10.8 ac) of land area over the 40-year plant life. Waste impacts to groundwater and surface water would extend beyond the operating life of the plant if leachate and runoff from the waste storage area occurs, though proper management can prevent this pollution. In addition, the small size of the waste disposal area makes other waste impacts less likely. IGCC slag would need to be handled in accordance with state and national regulations. After closure of the waste site and revegetation, the land would be available for other uses

Debris would be generated during construction activities. This would likely be disposed onsite, when possible. Overall, this amount of waste would be small compared to operational waste generated, and many construction wastes can be recycled. As such, construction-stage waste impacts would be SMALL.

For all of the preceding reasons, the appropriate characterization of impacts from waste generated by a coal-fired IGCC plant located at the HNP site would be SMALL.

Siting the facility at a site other than HNP would not alter waste generation, although other sites might have more constraints on disposal locations. If a coal facility was sited on a previously developed location, then there may also be fewer constraints on waste disposal. Therefore, the impacts would likely be SMALL to MODERATE.

- Human Health

IGCC coal-fired power generation introduces worker risks from coal mining, from coal transportation, and from disposal of slag as well as transportation of reusable byproducts. In addition there are public risks from inhalation of stack emissions. Emission impacts can be widespread and health risks difficult to quantify. The coal-fired IGCC alternative also introduces the risk of coal-pile fires and attendant inhalation risks.

In the GEIS, the NRC staff stated that there would be human health impacts (cancer and emphysema) from inhalation of toxins and particulates, but it did not identify the significance of these impacts (NRC 1996).

Regulatory agencies, including EPA and State agencies, set air emission standards and requirements based on human health impacts. These agencies also impose site-specific emission limits as needed to protect human health. As discussed previously, EPA has recently concluded that certain segments of the U.S. population (e.g., the developing fetus and subsistence fish-eating populations) are believed to be at potential risk of adverse health effects due to mercury exposures from sources such as coal-fired power plants, though these emissions are likely to be smaller from IGCC plants than from conventional coal-fired plants. In the absence of more quantitative data, human health impacts from radiological doses and inhaling toxins and particulates generated by burning coal would be characterized as SMALL.

- Socioeconomics

Construction of the IGCC coal-fired alternative would take approximately 4 years (DOE/EIA 2006b). The NRC staff assumed that construction would take place while HNP continues operation and would be completed by the time it permanently ceases operations in 2026. The work force would be expected to include between 1170 and 2440 workers (based on estimates for natural gas and coal-fired power plants in NRC 1996). These workers would be in addition to the approximately 720 workers currently employed at HNP. During construction, the surrounding communities would experience an increased demand for rental housing and public services, though this would be moderated by the proximity of the site to urban areas. After construction, the communities would be impacted by the loss of the construction jobs, though rapid economic growth in the area would mitigate these impacts.

If the coal-fired IGCC plant were constructed at the HNP site and HNP were decommissioned, there would be a loss of approximately 473 to 576 permanent high-paying jobs (720 for HNP to between 147 and 244 for the IGCC coal-fired plant), with a commensurate reduction in demand on socioeconomic resources and tax contribution to the regional economy. The coal-fired IGCC plant would provide a new tax base to offset the loss of tax base associated with decommissioning of the HNP unit in Wake County. Other counties would likely experience little impact, as HNP pays 90% of its local taxes to Wake County. Since the region's growing economy effectively mitigates most socioeconomic impacts of both construction and operation, the appropriate characterization of non-transportation socioeconomic impacts for an IGCC coal-fired plant constructed at the HNP site would be SMALL to MODERATE

During the 4-year construction period of the IGCC coal-fired units, between 1172 and 2440 construction workers would be commuting to the site in addition to the 720 workers at HNP. The addition of these workers would increase traffic loads on existing highways, particularly on surface roads in and around the plant. These transportation impacts would be SMALL to MODERATE.

For transportation related to commuting of plant operating personnel, the impacts would be considered SMALL. The maximum number of plant operating personnel would be approximately 244. The current HNP work force is approximately 720. Therefore, traffic impacts associated with plant personnel commuting to an IGCC coal-fired plant would be expected to be SMALL, and smaller than the impacts of renewing the license for HNP.

For rail transportation related to coal delivery to the HNP site, the impacts would be considered SMALL. NRC staff estimates that approximately 245 unit trains per year would deliver coal for IGCC alternative, while trains or trucks would remove sulfur and slag for marketing. Approximately 5 unit trains would deliver coal each week, or more than one trip per day on the spur leading to the plant, because for each full train delivery there would be an empty train.

Construction of a replacement coal-fired IGCC power plant at an alternate site would relocate some socioeconomic impacts. The communities around HNP would experience the relatively minor impact of HNP operational job loss, and the communities around the new site would have to absorb the impacts of a large, temporary work force (up to 2440 workers at the peak of construction) and a permanent work force ranging from 147 to 244 workers. In the GEIS, the NRC staff stated that socioeconomic impacts at a rural site would be larger than at an urban site, because more of the peak construction work force would need to move to the area to work. The HNP site is in the Raleigh-Durham-Chapel Hill metropolitan area and is therefore not considered a rural site. Alternate sites would need to be analyzed on a case-by-case basis. Alternate industrial sites, however, tend to be close to metropolitan areas, and may still have remaining transportation infrastructure nearby. Socioeconomic impacts at a rural site would be LARGE, while impacts at previously developed industrial site would be SMALL to MODERATE.

Transportation-related impacts associated with commuting construction workers at an alternate site are site dependent, but could be SMALL to LARGE. Transportation impacts related to commuting of plant operating personnel would also be site dependent, but would be best characterized as SMALL.

At an alternate site, coal would also likely be delivered by rail. Transportation impacts would depend upon the site location. Socioeconomic impacts associated with rail transportation would likely be SMALL, though dependent on coal train routing. Socioeconomic impacts associated with rail transportation on a previously developed industrial site would likely be SMALL.

- Aesthetics

If sited at the current HNP location, the IGCC coal-fired power plant units would be as much as 60 m (200 ft) tall. Given the site's heavy forestation, these units would likely not be visible offsite. The two exhaust stacks would be similar in height to those of a natural gas-fired combined cycle plant, and shorter than the 122 to 183 m (400 to 600 ft) estimated for a supercritical coal-fired plant. Given the current presence of a cooling tower and its plume, as well as other plant structures on-site, the addition of plant stacks would not drastically increase visual impacts. The units and associated stacks would also be visible at night because of outside lighting. Visual impacts of a new coal-fired plant could be mitigated by landscaping and color selection for buildings that is consistent with the environment. Visual impact at night could be mitigated by reduced lighting and appropriate shielding. The visual impacts at the HNP site would be SMALL.

Coal-fired IGCC generation would introduce mechanical sources of noise at the site. Given the low population offsite of the plant's property and the screening effect of trees onsite, offsite noise would be unlikely to be obtrusive. Sources contributing to total noise produced by plant operation are classified as continuous or intermittent. Continuous sources include the mechanical equipment associated with normal plant operations. Intermittent sources include the equipment related to coal handling, solid-waste disposal, transportation related to coal and lime delivery, use of outside loudspeakers, and the commuting of plant employees. The incremental noise impacts of a coal-fired plant compared to existing HNP operations would be considered SMALL.

Noise impacts associated with rail delivery of coal to a plant at the HNP site would be most significant for residents living in the vicinity of the facility and along the rail route. Although noise from passing trains significantly raises noise levels near the rail corridor, the short duration of the noise reduces the impact. The number of people affected by transportation would depend on the rail route. As such, the impacts of train noise on residents in the vicinity of the facility and the rail line would be SMALL to MODERATE.

At an alternate site, there would be an aesthetic impact from the buildings, exhaust stacks, cooling towers, and the plume associated with the cooling towers. There would be a significant aesthetic impact associated with construction of a new transmission line to connect to other lines to enable delivery of electricity. Noise and light from the plant may be detectable offsite, depending on plant characteristics. Aesthetic impacts at the plant site would be mitigated if the plant were located in an industrial area adjacent to other power plants. Noise impacts from a rail spur, if required, would be similar to the impacts at the existing site. Overall the aesthetic impacts associated with locating at an alternate site could range from SMALL to LARGE, depending on site characteristics. Some of these issues would be rectified if the IGCC coal plant were sited at a previously developed site, as many contain some level of rail or transmission infrastructure, and would be in areas accustomed to industrial uses. Impacts at a previously developed site would be SMALL to MODERATE.

- Historic and Archaeological Resources

At the HNP site, a cultural resource inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also likely need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

Before construction at an alternate, undeveloped site, studies would be needed to identify, evaluate, and develop mitigation measures for the potential impacts of new plant construction on cultural resources. The studies would be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission corridors, rail lines, or other rights-of-way). Historic and archaeological resource impacts can generally be effectively managed and as such would be considered SMALL for the existing site and would be SMALL to MODERATE at a new site. For a previously developed site, impacts on cultural and historic resources would be SMALL, as the area has previously been developed, and previous development either removed or surveyed items of archaeological interest.

- Environmental Justice

No environmental impacts were identified that would result in disproportionately high and adverse environmental impacts to minority and low-income populations if a replacement IGCC coal-fired plant were built at the HNP site. Some impacts on housing availability and lease prices during construction would occur, and this could disproportionately affect the minority and low-income populations.

Impacts on minority and low-income populations due to the shutdown of HNP would depend on the number of jobs and the amount of tax revenue lost to the communities surrounding the power plant. Closure of HNP would reduce the overall number of jobs and tax revenue generated in the region that was directly and indirectly attributed to plant operations. However, given the rapid economic growth of Wake County and the Raleigh-Durham area, it is likely that these losses would be replaced by the development of new businesses and new sources of tax revenue in the region. Since CP&L's tax payments represent a small percentage of Wake County's total annual property tax revenue, it is unlikely that social services would be seriously affected. Therefore, minority and low-income populations in the vicinity of HNP would not likely experience any disproportionately high and adverse socioeconomic impacts from the shutdown of HNP.

The environmental effect of plan shutdown would reduce the amount of operational impacts on the environment. Therefore, minority and low-income populations in the vicinity of HNP would not likely experience any disproportionately high and adverse environmental impacts from the shutdown of HNP.

Impacts at other sites would depend upon the site chosen and the nearby population distribution, but would be SMALL to MODERATE for alternate sites. For previously developed industrial sites, impacts would be larger, depending on the locations of low-income populations.

8.2.3 Natural Gas-Fired Combined-Cycle Generation

In this section, NRC staff examines the environmental impacts of the natural gas-fired alternative at both the HNP site and at an alternate site. The NRC staff assumed that a natural gas-fired plant would use a closed-cycle cooling system. At the HNP site, the NRC staff assumed that the new plant would make use of the existing cooling system, including cooling tower, intake, and outlet.

If a new natural gas-fired plant were built on the existing property to replace HNP, approximately 3.2 km (2 mi) of new, 20-cm (8-in.) gas pipeline would be necessary to connect the plant to existing gas pipelines north of the plant (Progress Energy 2006b). This would require a 15-m (50-ft) wide corridor, resulting in disturbance to as much as 4.9 ha (12 ac) of land. CP&L indicates that this new pipeline may necessitate additional improvements to the statewide pipeline system.

NRC staff assumed that a replacement natural gas-fired plant would use combined-cycle technology. Compared to simple-cycle combustion turbines, combined cycle plants are significantly more efficient, and thus provide electricity at lower levelized costs. Typically, they support intermediate loads, but they are capable of supporting a baseload duty cycle and thus provide an alternative to the renewed operating license.

In a combined-cycle unit, hot combustion gases in a combustion turbine rotate the turbine to generate electricity. Waste combustion heat from the combustion turbine is routed through a heat-recovery steam generator, which then powers a steam turbine electrical generator.

In the HNP ER, CP&L asserts that three units based on existing Siemens combined cycle systems would be constructed to replace HNP (Progress Energy 2006b). After reviewing commercially available combined cycle power plant, the NRC staff assumed that these units would be Siemens SCC6-5000F units with heat rates of 5990 Btu/kWh. NRC staff believes these units appropriately reflect modern combined-cycle power plant technology, and also note that examining these units for the purpose of environmental impact analysis does not mean that they are the units most likely to be chosen by CP&L or other relevant authorities should they choose to implement a gas-fired alternative.

The NRC staff reviewed this information and compared it to environmental impact information in the GEIS. Although the operating license renewal period is only 20 years, the impact of operating the natural gas-fired alternative for 40 years is considered (though this may modestly exceed the expected lifetime of a combined-cycle plant, it is consistent with impacts for the other fossil-fueled alternatives).

NRC staff discusses the overall impacts of the natural gas-fired generating system in the following sections and summarizes them in Table 8-4. The extent of impacts at an alternate site would depend on the location of the site selected.

- Land Use

  For siting at HNP, existing facilities and infrastructure would be used to the extent practicable, limiting the amount of new construction that would be required. Specifically, the NRC staff assumed that the natural gas-fired replacement plant alternative would use the cooling tower system, switchyard, offices, and transmission line rights-of-way. Much of the land that would be used has been previously disturbed. NRC staff in the GEIS asserted that a 1000 MWe gas-fired plant would require 45 ha (110 ac). As such, a plant of the size proposed for replacing HNP's capacity would require 40 ha (100 ac). NRC staff notes that by using structures from the existing HNP unit, land use impacts would be minimized. CP&L estimated a land-use impact of 24 ha (60 ac) for a gas-fired alternative constructed on the HNP site (Progress Energy 2006b). There would be an additional impact of up to approximately 4.9 ha (12 ac) for construction of a gas pipeline.

  For construction at an alternate site, the NRC staff assumed that 40 ha (100 ac) would be needed for the plant and associated infrastructure. In addition, anywhere from tens to thousands of acres would be disturbed by installing gas pipelines and electric transmission lines. NRC staff expects that this area would be reduced if a gas-fired alternative was constructed on a previously-developed industrial site. Many former industrial sites have easier access to pipelines and transmission capacity than undeveloped sites.

Regardless of where a gas-fired alternative is built, additional land would be required for natural gas wells and collection stations. According to the GEIS, a 1000 MWe gas-fired plant requires approximately 1500 ha (3600 ac) for wells, collection stations, and pipelines (NRC 1996). Much of the land area necessary for the gas-fired alternative would be in existing gas-extraction areas. Partially offsetting these offsite land requirements would be the elimination of the need for uranium mining to supply fuel for HNP. In the GEIS (NRC 1996), the NRC staff estimated that approximately 400 ha (1000 ac) would be affected for mining the uranium and processing it during the operating life of a 1000 MWe nuclear power plant. Overall, land-use impacts would be SMALL to MODERATE for an alternative at the HNP site. Impacts would generally be similar at an undeveloped site, as the primary driver for these impacts would be the large area of land necessary for natural gas infrastructure. At an alternate site, additional pipelines or transmission lines may also be necessary. As such, impacts would be SMALL to LARGE

1 **Table 8-4**. Summary of Environmental Impacts of Natural Gas-Fired Generation at HNP Site
2 and an Alternate site Using Closed-Cycle Cooling

Impact Category	HNP Site		Alternate Site	
	Impact	**Comments**	**Impact**	**Comments**
Land Use	SMALL to MODERATE	Less than 40 ha (100 ac) for powerblock, offices, roads, and parking areas, some of which would be reused from the existing HNP site. Additional impact of up to approximately 4.9 ha (12 ac) for construction of an underground gas pipeline.	SMALL to LARGE	Approximately 40 ha (100 ac) for power block, offices, roads, and parking areas. Power line and gas pipeline impacts may vary widely, from tens of acres to thousands of acres. Previously developed sites would experience lower impacts than undeveloped sites.
Ecology	SMALL	As the alternative would use undeveloped areas at the current HNP site, terrestrial impacts would be minimal. Relatively little land would be disturbed for a pipeline, though actual land characteristics would drive pipeline impacts. Aquatic ecology actually benefits from gas-fired alternative, as the combined-cycle plant requires significantly less makeup water and discharges less blowdown than HNP.	SMALL to MODERATE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and transmission and pipeline routes; potential habitat loss and fragmentation; reduced productivity and biological diversity. These issues would be much smaller on a previously developed site.
Water Use and Quality—Surface Water	SMALL	Uses a closed-cycle cooling system with natural gas-fired combined-cycle units. This would result in a significant reduction in water use due to lower levels of heat rejection.	SMALL to MODERATE	Impact depends on volume of water withdrawn and discharged, as well as characteristics of the surface water body.
Water Use and Quality—Groundwater	SMALL	HNP uses no groundwater. A combined-cycle alternative would continue to use Harris Reservoir for all water needs rather than use groundwater.	SMALL to MODERATE	Impact depends on volume of water withdrawal, though, though it is not likely to be used for cooling makeup.

Impact Category	HNP Site		Alternate Site	
	Impact	Comments	Impact	Comments
Air Quality	SMALL to MODERATE	Emissions: • Sulfur oxides 62.3 MT (69 tons/yr) • Nitrogen oxides 200 MT (220 tons/yr) • Carbon monoxide 41.5 MT (46 tons/yr) • PM_{10} particulates 34.8 MT (38 tons/yr) • Small amounts of hazardous air pollutants	SMALL to MODERATE	Same emissions as at HNP site.
Waste	SMALL	Solid waste primarily due to emission controls and plant operations.	SMALL	Same waste produced as at the HNP site.
Human Health	SMALL	Impacts are uncertain, but considered SMALL as the plant would comply with health-informed standards in the Clean Air Act and other relevant emissions regulations.	SMALL	Similar impacts to those at the HNP site.
Socioeconomics	SMALL	During construction, impacts would be SMALL. Up to 1090 additional workers during the peak of the 3-year construction period, followed by reduction from current HNP work force of 720 to 136; tax base preserved. Impacts during operation would be SMALL.	SMALL to MODERATE	During construction, impacts would be SMALL to MODERATE, depending on site. Up to 1090 additional workers during the peak of the 3-year construction period. Wake county would lose jobs and tax base, while other counties would lose jobs. Impacts during operation would be SMALL.
Socioeconomics (Transportation)	SMALL to MODERATE	Transportation impacts would likely be SMALL to MODERATE, primarily with construction activities.	SMALL to MODERATE	Transportation impacts could be SMALL to MODERATE, primarily with construction activities.

Impact Category	HNP Site		Alternate Site	
	Impact	Comments	Impact	Comments
Aesthetics	SMALL	Aesthetic impact due to plant units and stacks would be minor compared to exiting HNP structures.	SMALL to MODERATE	Greatest impact would be from the new transmission line and pipeline right-of-way that would be needed. Overall impact would be SMALL for previously developed sites and SMALL to MODERATE for undeveloped sites.
Historic and Archeological Resources	SMALL	Any potential impacts could be effectively managed given the plant's small footprint.	SMALL to MODERATE	Any potential impacts would be effectively managed, though pipeline and transmission line may have SMALL to MODERATE impacts.
Environmental Justice	SMALL	Impacts on minority and low-income communities would be similar to those experienced by the population as a whole, which are SMALL. Some additional impacts on rental housing may occur during construction, though these would not be noticeable.	SMALL to MODERATE	Impacts would vary depending on population distribution and location of the site.

- Ecology

At the HNP site, there would be ecological impacts to land use for siting of the gas-fired plant, though these are likely to be small since the disturbed area of the plant would likely accommodate a new combined-cycle gas plant. There would also be some ecological impacts associated with bringing a new underground gas pipeline to the HNP site, though this is dependent upon habitat disturbed during construction, which is, in turn, dependent on pipeline routing. Since CP&L estimates this pipeline would require only 4.9 ha (12 ac) to reach the plant, this impact is unlikely to noticeably affect important ecological features. Aquatic ecology actually benefits from gas-fired alternative, as the combined-cycle plant requires significantly less makeup water and discharges less blowdown than HNP. Ecological impacts at an alternate site would depend on the nature of the land converted for the plant and the possible need for a new gas pipeline and/or transmission line. Construction of the transmission line and construction and/or upgrading of the gas pipeline to serve a plant at an alternate site would have temporary ecological impacts, though these would be substantial. Ecological impacts to the plant site and utility rights of way would include impacts on threatened or endangered species, wildlife habitat loss and reduced productivity, habitat fragmentation, and a local reduction in biological diversity. At an alternate site, the cooling makeup water intake and discharge would have aquatic resource impacts. These impacts would be smaller at a previously developed site, owing to generally closer access to pipelines and transmission lines than at greenfield sites. Overall, the ecological impacts would be considered SMALL at the HNP site and SMALL to MODERATE at a different location.

- Water Use and Quality

Surface Water. Combined-cycle gas-fired plants are highly efficient and require less cooling water than other generation alternatives, including the existing plant. Plant discharge would consist mostly of cooling tower blowdown, with the discharge having a slightly higher temperature and increased concentration of dissolved solids relative to the receiving body of water, as well as intermittent low concentrations of biocides (e.g., chlorine). In addition to the cooling tower blowdown, process waste streams and sanitary waste water would also be discharged, though these discharges would be much smaller than at the existing plant since a gas-fired alternative would employ many fewer people. All discharges would be regulated through a NPDES permit, which is administered by NCDENR. Finally, some erosion and sedimentation would probably occur during construction (NRC 1996), though the GEIS indicates this would be SMALL. Overall, the impacts to water use and quality at the HNP site from a gas-fired alternative would be considered SMALL, and would be less than the proposed action.

A natural gas-fired plant at an alternate site is assumed to use a closed-cycle cooling system with cooling towers. The NRC staff assumed that surface water would be used for cooling makeup water and discharge. Intake and discharge would involve relatively small quantities of water compared to once-through cooling. The impact on the surface water would depend on the volume of water needed for makeup water, the discharge volume, and the characteristics of the receiving body of water. Intake from and discharge to any surface body of water would be regulated by the NCDENR. The impacts would be SMALL to MODERATE.

Groundwater. HNP currently uses no groundwater. It is likely that a gas-fired alternative would also not use groundwater. Impacts at the HNP site would thus be SMALL. Groundwater impacts at an alternate site may vary widely depending on whether the plant uses groundwater for any of its water needs, though it would be unlikely that a plant on an alternate site would use groundwater for cooling system makeup water. Impacts at an alternate site would be SMALL to MODERATE.

- Air Quality

Natural gas is a relatively clean-burning fuel. The gas-fired alternative would release similar types of emissions, but in lesser quantities, than the coal-fired alternative.

Currently, Wake County and the neighboring counties of Johnston, Chatham, Durham, Franklin and Nash are non-attainment areas for ozone under the Clean Air Act (EPA 2007b). These counties are either in attainment or unclassified for other criteria pollutants (EPA 2007b). A new gas-fired plant located in an ozone non-attainment area would need to purchase emissions credits from existing emitters of ozone-causing chemicals, including NO_x.

A gas-fired alternative at the HNP site or another non-attainment area site would require Non-Attainment Area permit and a Title V operating permit under the Clean Air Act. A new combined-cycle natural gas power plant would also be subject to the new source performance standards for such units at 40 CFR 60, Subparts Da and GG. These regulations establish emission limits for particulates, opacity, SO_2, and NO_x.

EPA has various regulatory requirements for visibility protection in 40 CFR 51, Subpart P, including a specific requirement for review of any new major stationary source in an area designated attainment or unclassified under the Clean Air Act.

Section 169A of the Clean Air Act (42 USC 7491) establishes a national goal of preventing future and remedying existing impairment of visibility in mandatory Class I Federal areas when impairment results from man-made air pollution. EPA issued a new regional haze rule in 1999 (64 FR 35714) (EPA 1999). The rule specifies that for each mandatory Class I Federal area located within a State, the State must establish goals that provide for reasonable progress towards achieving natural visibility conditions. The reasonable progress goals must provide for an improvement in visibility for the most impaired days over the period of the implementation plan and ensure no degradation in visibility for the least-impaired days over the same period (40 CFR 51.308(d)(1)). If a natural gas-fired plant were located close to a mandatory Class I area, additional air pollution control requirements would be imposed. North Carolina contains five Class I areas, one of which, Swanquarter Wilderness Area, is potentially downwind of a coal-fired alternative at HNP (EPA 2007a). Swanquarter is approximately 298 km (185 mi) east of the HNP site. A gas-fired alternative at HNP may need additional pollution controls to keep from impairing visibility in this area. Additionally, a gas-fired plant at an alternate site nearer to a Class I area may require even more stringent controls.

NRC staff projects the following emissions for a gas-fired alternative based on EPA emissions factors (EPA 2000a):

- Sulfur oxides – 62.3 tons/yr
- Nitrogen oxides – 200 tons/yr

- Carbon monoxide – 41.5 tons/yr
- PM_{10} particulates – 34.8 tons/yr

The total amount of nitrogen oxides which can be emitted by North Carolina in the 2007 ozone season (May 1–September 30) is set out at 40 CFR 51.121(e). For North Carolina, the amount is 150,000 MT (165,306 tons). A new gas-fired power plant would need to buy credits if it was likely to cause North Carolina to exceed this amount.

A natural gas-fired plant would also have unregulated carbon dioxide emissions. An IGCC plant would emit approximately 2,330,000 tons of CO_2 per year (2,110,000 MT) (DOE/EIA 2007a).

In December 2000, EPA issued regulatory findings on emissions of hazardous air pollutants from electric utility steam-generating units (EPA 2000b). Natural gas-fired power plants were found by EPA to emit arsenic, formaldehyde, and nickel (EPA 2000b). Unlike coal and oil-fired plants, EPA did not determine that emissions of hazardous air pollutants from natural gas-fired power plants should be regulated under Section 112 of the Clean Air Act.

Construction activities would also result in some air effects, including those from temporary fugitive dust, though construction crews would employ dust-control practices to limit this impact. Exhaust emissions would also come from vehicles and motorized equipment used during the construction process, though these emissions are likely to be intermittent in nature and will occur over a limited period of time. As such, construction stage impacts would be SMALL.

The overall air-quality impact for a new natural gas-fired plant sited at HNP or at an alternate site would be SMALL to MODERATE, depending on control technology employed during the operating stage.

- Waste

Burning natural gas fuel generates small amounts of waste, though a plant using selective catalytic reduction (SCR) to control NO_x will generate spent SCR catalyst from NO_x emissions control and small amounts of solid-waste products (i.e., ash). In the GEIS, the NRC staff concluded that waste generation from gas-fired technology would be minimal (NRC 1996). Waste-generation impacts would be so minor that they would not noticeably alter any important resource attribute.

Constructing a gas-fired alternative would generate small amounts of waste, though many construction wastes can be recycled, and land-clearing debris would be disposed of onsite.

Overall, the waste impacts would be SMALL for a natural gas-fired plant sited at HNP or at an alternate site.

- Human Health

  In Table 8-2 of the GEIS, the NRC staff identifies cancer and emphysema as potential health risks from gas-fired plants (NRC 1996). The risk may be attributable to NO_x emissions that contribute to ozone formation, which in turn contribute to health risks. NO_x emissions from any gas-fired plant would be regulated as mentioned in the Air Quality section. Human health effects would not be detectable or would be sufficiently minor that they would neither destabilize nor noticeably alter any important attribute of the resource. Overall, the impacts on human health of the natural gas-fired alternative sited at HNP or at an alternate site would be considered SMALL.

- Socioeconomics

  Construction of a natural gas-fired plant would take approximately 3 years (DOE/EIA 2006b). Peak employment would be approximately 1090 workers (NRC 1996). NRC staff assumed that construction would take place while HNP continues operation and would be completed by the time it permanently ceases operations. During construction, the communities surrounding the HNP site would experience an increased demand for rental housing and public services that would have SMALL impacts given the area's population. These impacts could be reduced by construction workers commuting to the site from other parts of the Raleigh-Durham-Chapel Hill area. The natural gas-fired plant would provide a new tax base to offset the loss of tax base associated with decommissioning of the HNP unit in Wake County. Other counties would likely experience little impact, as HNP pays 90% of its local taxes to Wake County. Since the region's growing economy effectively mitigates most socioeconomic impacts of both construction and operation, the appropriate characterization of non-transportation socioeconomic impacts for a natural gas-fired plant constructed at the HNP site would be SMALL to MODERATE. For siting at an alternate site, impacts in Wake County would be SMALL from loss of tax base.

  Compared to the coal-fired and nuclear alternatives, the smaller size of the construction work force, the shorter construction time frame, and the smaller size of the operations work force would mitigate socioeconomic impacts. In addition, the communities around HNP would experience relatively minor impacts of HNP operational job loss and loss of tax revenue. For these reasons, socioeconomic impacts associated with construction and operation of a natural gas-fired power plant would be SMALL for siting at HNP, and SMALL to MODERATE at an alternate site.

  Transportation impacts associated with construction and operating personnel commuting to the plant site would depend on the population density and transportation infrastructure in the vicinity of the site. The impacts would be SMALL to MODERATE for siting at either HNP or an alternate site.

- Aesthetics

At the HNP site, the two turbine buildings (100 ft tall) and four exhaust stacks (approximately 150 ft tall) would not be visible during daylight hours from offsite due to extensive site forestation. The gas pipeline compressors may be visible if they are located near roads, though they are relatively small. Noise and light from the plant may be detectable offsite, but would also be screened by the site's trees. The visual impact, then from a new combined-cycle plant on the current HNP site, would be SMALL.

At an alternate site, the buildings, cooling towers, cooling tower plumes, and the associated transmission line and gas pipeline compressors may be visible offsite. Visual impacts from new transmission lines or a pipeline right-of-way would also be significant, though these may be minimized by building near transmission or on previously-developed land. Additionally, aesthetic impacts would be mitigated if the plant were located in an industrial area adjacent to other power plants. Unlike the coal-fired alternatives, the gas-fired plant lacks a coal pile, rail spur, and frequent coal deliveries. Overall, the aesthetic impacts associated with an alternate site would be SMALL to MODERATE.

- Historic and Archaeological Resources

At HNP, a cultural resource inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also need an inventory of cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site. Since the gas-fired alternative uses little land, and most of it would have been previously disturbed, the impact of the gas-fired alternative at the HNP site would be SMALL.

Before construction at an alternate site, studies would likely be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources. The studies would be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission and pipeline corridors, or other rights-of-way). Building on a previously developed site would minimize the likelihood of affecting historical or archaeological resources, as previous development either removed these resources or previous studies identified their locations. At an alternate, undeveloped site, the impact would be SMALL to MODERATE

- Environmental Justice

No environmental impacts were identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement natural gas-fired plant were built at the HNP site. Some impacts on housing availability and lease prices during construction might occur, and this could affect minority and low-income populations.

Impacts on minority and low-income populations due to the shutdown of HNP would depend on the number of jobs and the amount of tax revenue lost to the communities surrounding the power plant. Closure of HNP would reduce the overall number of jobs and tax revenue generated in the region that was directly and indirectly attributed to plant operations. However, given the rapid economic growth of Wake County and the Raleigh-Durham area, it is likely that these losses would be replaced by the development of new businesses and new sources of tax revenue in the region. Since CP&L's tax payments represent a small percentage of Wake County's total annual property tax revenue, it is unlikely that social services would be seriously affected. Therefore, minority and low-income populations in the vicinity of HNP would not likely experience any disproportionately high and adverse socioeconomic impacts from the shutdown of HNP.

The environmental effect of plan shutdown would reduce the amount of operational impacts on the environment. Therefore, minority and low-income populations in the vicinity of HNP would not likely experience any disproportionately high and adverse environmental impacts from the shutdown of HNP.

Impacts at an alternate site would depend upon the site chosen, nearby population characteristics, and economic opportunity. These impacts would range from SMALL to MODERATE, depending on the distribution of low-income and minority population.

8.2.4 New Nuclear Generation

Since 1997 the NRC has certified four new standard designs for nuclear power plants under 10 CFR 52, Subpart B. These designs are the 1300 MWe U.S. Advanced Boiling Water Reactor (10 CFR 52, Appendix A), the 1300 MWe System 80+ Design (10 CFR 52, Appendix B), the 600 MWe AP600 Design (10 CFR 52, Appendix C), and the 1100 MWe AP1000 Design (10 CFR 52, Appendix C). One additional design is awaiting certification, and five others are undergoing pre-application reviews. All of the designs currently certified or awaiting certification are light-water reactors. Several designs in pre-application review are not light water reactors; these include the helium-cooled Pebble Bed Modular Reactor and the heavy water moderated and cooled Advanced Candu Reactor, ACR-700. Although NRC has received no applications for a construction permit or a combined license based on certified designs, NRC has received several early site permit (ESP) applications, and has approved the first ESPs at the Clinton site near Clinton, Illinois (ESP issued on March 15, 2007), and the Grand Gulf site, in Claiborne County, Mississippi (ESP issued on March 27, 2007). These ESP applications and design certification applications indicate continuing interest in the possibility of licensing new nuclear power plants. In addition, recent escalation in natural gas and electricity prices have made new nuclear power plant construction more attractive from a cost standpoint, though academic and investment communities remain uncertain as to what new nuclear plants will actually cost. Given current uncertainty and expressed industry interest in new nuclear construction, NRC staff will evaluate the new nuclear generation option in depth for both the HNP site and an alternate site. CP&L did not consider a new nuclear reactor at an alternate site in the HNP ER.

The NRC staff assumed that the new nuclear plant would have a 40-year lifetime. This allows for comparisons between a new nuclear plant and other alternatives, and also coincides with the initial licensing period for a new nuclear plant.

NRC has summarized environmental data associated with the uranium fuel cycle in Table S-3 of 10 CFR 51.51. The impacts shown in Table S-3 are representative of the impacts that would be associated with a replacement nuclear power plant built to one of the certified designs, sited at HNP or an alternate site. The impacts shown in Table S-3 are for a 1000-MWe reactor and would need to be adjusted to reflect impacts of 900 MW of new nuclear power.(7) The environmental impacts associated with transporting fuel and waste to and from a light-water cooled nuclear power reactor are summarized in Table S-4 of 10 CFR 51.52. NRC staff summarize findings on National Environmental Policy Act (NEPA) issues for license renewal of nuclear power plants in Table B-1 of 10 CFR 51 Subpart A, Appendix B.

NRC staff notes that this analysis addresses the potential impacts of a reactor constructed at the current HNP site for the purposes of replacing the existing HNP unit. This analysis is not meant to be indicative of the impacts one would expect from the two units that CP&L has indicated they may possibly construct at the HNP site should they file a combined construction and operating license (COL) application and receive approval from NRC. NRC staff would initiate a separate, detailed environmental impact statement to address the design-specific and site-specific impacts from those units if and when CP&L submits a COL.

NRC staff discusses the overall impacts of a new nuclear generating alternative in the following sections, and summarizes impacts in Table 8-5. The extent of impacts at an alternate site would depend on the location of the particular site selected.

- Land Use

  The existing facilities and infrastructure at the HNP site would be used to the extent practicable, limiting the amount of new construction that would be required. Specifically, the

(7) NRC staff notes that while Table S-3 does not estimate impacts from unregulated CO_2 emissions during the nuclear fuel cycle, Table S-3 does indicate that energy consumed during the cycle is roughly equal to that generated by a 45 MWe conventional coal-fired plant, and thus provides a means of approximating unregulated CO_2 emissions.

NRC staff assumed that a replacement nuclear power plant would use the existing cooling tower system, switchyard, offices, and transmission line rights-of-way. Much of the land that would be used has been previously disturbed.

A replacement nuclear power plant at the HNP site would alter approximately 200 to 400 ha (500 to 1000 ac) of land to plant use (NRC 1996). Some of this land may already have been converted into parking lots or other auxiliary structures and can be modified to support the new plant. There would be little net change in land needed for uranium mining because land needed for the new nuclear plant would offset land needed to supply uranium for fuel HNP, though the GEIS indicates that new reactor designs may require more uranium than existing plants.

The impact of a replacement nuclear generating plant on land use at the existing HNP site would be best characterized as MODERATE. This impact would be greater than the operating license renewal alternative, as well as greater than the gas-fired alternative and likely similar to that of the coal-fired alternatives.

Land-use impacts at an alternate site would be similar to siting at HNP except for the land needed for transmission lines necessary to connect to existing lines, and a rail spur to allow deliver of major components and fuel. Depending on the site, anywhere from tens to thousands of acres may be necessary. The need to construct transmission and rail capacity would likely be reduced at a previously developed industrial site, though it would not necessarily be eliminated. Depending particularly on transmission line routing and rail spur siting, siting a new nuclear plant at an alternate site would result in MODERATE to LARGE land-use impacts.

- Ecology

Locating a new nuclear unit at the HNP site would affect ecological resources, but existing site maintenance practices and the site's industrial nature would minimize additional impacts from the new plant on terrestrial ecology.

Siting at HNP would have a SMALL to MODERATE ecological impact that would be greater than renewal of the HNP operating license. Impacts become greater if more undeveloped land is converted to industrial uses.

At an alternate site, there would be construction impacts and new incremental operational impacts. Even assuming siting at a previously disturbed area, the impacts may include wildlife habitat loss, reduced productivity, habitat fragmentation, and a local reduction in biological diversity, depending on the degree to which the site was previously disturbed and how much remediation has taken place. A new nuclear plant at an alternate site would likely also make use of cooling towers, and would incur similar aquatic impacts to the existing HNP unit. At a new site, these impacts would likely be MODERATE, due primarily to terrestrial impacts, but also depending on the characteristics of the water body used for cooling.

Table 8-5. Summary of Environmental Impacts of New Nuclear Power Generation at the HNP Site and an Alternate Site Using Closed-Cycle Cooling

Impact Category	HNP Site		Alternate Site	
	Impact	**Comments**	**Impact**	**Comments**
Land Use	MODERATE	Requires approximately 200 to 400 ha (500 to 1000 ac) for the plant. Fuel cycle effects are similar to the current plant.	MODERATE to LARGE	Same as HNP site plus land for transmission line and rail spur.
Ecology	SMALL to MODERATE	Uses undeveloped areas at current HNP site and may use offsite Progress Energy-owned areas. Aquatic ecology impacts would be similar to existing plant.	MODERATE	Impact depends on location and ecology of the site, surface water body used for intake and discharge, and transmission line route; potential habitat loss and fragmentation; reduced productivity and biological diversity.
Water Use and Quality—Surface water	SMALL	Uses existing cooling tower system.	SMALL to MODERATE	Impact would depend on the volume of water withdrawn and discharged and the characteristics of the surface water body.
Water Use and Quality—Groundwater	SMALL	Would likely use Harris Reservoir for all onsite water. A new nuclear plant would also use the existing cooling system.	SMALL to MODERATE	Impact would depend on the volume of water withdrawn, as well as characteristics of the aquifer. Groundwater would not be used for cooling system makeup water.
Air Quality	SMALL	Fugitive emissions and emissions from vehicles and equipment during construction; small amount of emissions from diesel generators and possibly other sources during operation.	SMALL	Same impacts as HNP site.

Impact Category	HNP Site		Alternate Site	
	Impact	Comments	Impact	Comments
Waste	SMALL	Waste impacts for an operating nuclear power plant are set out in 10 CFR 51, Appendix B, Table B-1. Debris would be generated and removed during construction.	SMALL	Same impacts as HNP site.
Human Health	SMALL	Human health impacts for an operating nuclear power plant are set out in 10 CFR 51, Appendix B, Table B-1.	SMALL	Same impacts as HNP site.
Socioeconomics	SMALL to MODERATE	During construction, impacts would be MODERATE, with up to 2250 workers during peak period of the 6-year construction period. The operating work force assumed to be similar to HNP; tax base preserved in Wake County, but may change in surrounding counties if workers don't transfer from one plant to another. Impacts during operation would be SMALL.	SMALL to LARGE	Construction impacts depend on location. Impacts at a rural location would be LARGE. Wake County would experience a loss of tax revenue while surrounding counties would lose employment, though rapid growth in the region would offset these impacts.
Socioeconomics (Transportation)	MODERATE	Transportation impacts would be MODERATE, due primarily to construction activities. Transportation impacts of commuting plant personnel would be SMALL even if their commuting patterns differ from current plant employees.	SMALL to LARGE	Transportation impacts would be MODERATE to LARGE, primarily with construction activities. Transportation impacts of commuting plant personnel would be SMALL to MODERATE.
Aesthetics	SMALL	No new exhaust stacks or cooling towers would be needed. New containment and turbine buildings would be visible in the immediate vicinity of the plant. Visual impact at night would be mitigated by reduced use of lighting and appropriate shielding. Noise impacts would be relatively small and would be mitigated.	MODERATE to LARGE	Greatest impact is likely from new cooling towers. Also, transmission lines or a rail spur would also have significant impacts. Impacts from containment and other buildings would also be noticeable.

Impact Category	HNP Site		Alternate Site	
	Impact	Comments	Impact	Comments
Historic and Archeological Resources	SMALL	Any potential impacts can likely be effectively managed. Any offsite land acquired would need to be surveyed.	SMALL to MODERATE	Any potential impacts can likely be effectively managed. Land would need to be surveyed. Impact likely smaller at previously developed site.
Environmental Justice	SMALL	Impacts on minority and low-income communities would be similar to those experienced by the population as a whole. Some impacts on rental housing may occur during construction, though most personnel are expected to travel from nearby urban areas.	SMALL to MODERATE	Impacts would vary depending on population distribution and location of the site. Impacts to minority and low-income populations from the closure of HNP would likely to be offset by the area's economic growth.

- Water Use and Quality

Surface Water. The replacement nuclear plant alternative at the HNP site is assumed to use the existing closed-cycle cooling tower system, which would minimize incremental water-use and quality impacts. Harris Reservoir would likely remain the source of other water required by the plant. Surface-water impacts are expected to remain SMALL.

Cooling towers would likely be used at alternate sites. For alternate sites, the impact on the surface water would depend on the volume of water needed for makeup water, the discharge volume, and the characteristics of the water body. Intake from and discharge to any surface body of water would be regulated by the DENR. The impacts would be SMALL to MODERATE.

Groundwater. The NRC staff assumed that a new nuclear power plant located at HNP would continue to obtain all water from Harris Reservoir.

Use of groundwater for a nuclear power plant located at an alternate site is a possibility. Any groundwater withdrawal would require a permit from the local permitting authority. A new plant is unlikely to use groundwater for cooling makeup water, however, given the volume of water necessary.

Overall, groundwater impacts at the current site would be SMALL, and at an alternate site would be SMALL to MODERATE.

- Air Quality

Construction of a new nuclear plant sited at HNP or an alternate site would result in fugitive dust emissions during the construction process. These impacts are intermittent and short-lived. To minimize dust generation, construction crews would use applicable dust-control measures. Exhaust emissions would also come from vehicles and motorized equipment used during the construction process, but these would also be of limited duration. An operating nuclear plant would have minor air emissions associated with diesel generators and other small-scale intermittent sources. Overall, air emissions and associated impacts would be SMALL.

- Waste

The waste impacts associated with operation of a nuclear power plant are set out in Table B-1 of 10 CFR 51, Subpart A, Appendix B. Construction-related debris would be generated during construction activities and removed to an appropriate disposal site. Overall, waste impacts would be SMALL.

Siting the replacement nuclear power plant at a site other than HNP would not alter waste generation. Therefore, the impacts would be SMALL.

- Human Health

Human health impacts for an operating nuclear power plant are set out in 10 CFR 51 Subpart A, Appendix B, Table B-1. Overall, human health impacts would be SMALL.

Siting the replacement nuclear power plant at a site other than HNP would not alter human health impacts. Therefore, the impacts would also be SMALL.

- Socioeconomics

The construction period and the peak work force associated with construction of a new nuclear power plant are currently unquantified (NRC 1996). In the absence of quantitative data, NRC staff assumed a construction period of 6 years (based on DOE/EIA 2006b) and a peak work force of 2250 (based on peak workforce for a 1000 MWe coal-fired plant and extrapolated to the current plant size). The NRC staff assumed that construction would take place while the existing nuclear unit continues operation and would be completed by the time HNP permanently ceases operations. During construction, the communities surrounding the HNP site would experience an increase demand for rental housing and public services that would have SMALL to MODERATE impacts. These impacts could be reduced by construction workers commuting to the site from other parts of the Raleigh-

Durham-Chapel Hill area or from other counties. After construction, the communities would be impacted by the loss of the construction jobs. An alternative site would experience SMALL to LARGE impacts, depending on characteristics of the surrounding community and local economy.

The replacement nuclear unit is assumed to have an operating work force comparable to the 720 workers currently working at HNPS. The replacement nuclear unit would provide new tax revenue to offset the loss of revenue associated with the decommissioning of HNP. New employment, as well as the area's economic growth, would also likely offset loss of HNP jobs. For all of these reasons, the appropriate characterization of non-transportation socioeconomic impacts for a replacement nuclear unit constructed at HNP would be SMALL; the socioeconomic impacts would be noticeable, but would be unlikely to destabilize the area.

During the 6-year construction period, up to 2250 construction workers would commute to the HNP site in addition to the 720 workers at HNP. The addition of the construction workers, equipment, and material would increase traffic loads on existing roads around the plant. Such impacts would be MODERATE. Transportation impacts related to commuting of plant operating personnel would be similar to current impacts associated with operation of HNP and would be SMALL.

Construction of a replacement nuclear power plant at an alternate site would relocate some socioeconomic impacts, but would not eliminate them. The communities around the HNP site would still experience the impact of operational job loss, though this would be offset by economic growth. The communities around the new site would have to absorb the impacts of a large, temporary work force (up to 2250 workers at the peak of construction) and a permanent work force of approximately 720 workers. In the GEIS (NRC 1996), the NRC staff indicated that socioeconomic impacts at a rural site would be larger than at an urban site because more of the peak construction work force would need to move to the area to work. The HNP site is within commuting distance of the Raleigh-Durham-Chapel Hill urban area and is therefore not considered a rural site. Alternate sites would need to be analyzed on a case-by-case basis. Non-transportation socioeconomic impacts at a rural site would be LARGE. Transportation-related impacts associated with commuting construction workers at an alternate site are site dependent, but would be MODERATE to LARGE. These may be mitigated somewhat if built on a previously developed site nearer to population, but such a site would likely face opposition from urban populations. Transportation impacts related to commuting of plant operating personnel at an alternate site would also be site dependent, but would be characterized as SMALL to MODERATE.

- Aesthetics

  The containment building for a replacement nuclear power plant sited at HNP, existing cooling tower, and as other associated buildings would be visible in daylight hours over many miles, though extensive forestation on site may help screen these structures. The replacement nuclear unit may be visible at night because of outside lighting. Visual impacts could be mitigated by landscaping and selecting a color for buildings that is consistent with the environment. Visual impact at night could be mitigated by reduced use of lighting and appropriate use of shielding. No exhaust stacks would be needed. Visual impacts would likely be SMALL.

  Noise impacts from a new nuclear plant would be similar to those from the existing HNP unit. Given the land area available around the plant, and potential noise mitigation measures, such as reduced use of outside loudspeakers, the impact of noise would be SMALL.

  At an alternate site, there would be an aesthetic impact from the buildings, cooling towers, and the plume associated with the cooling tower. There would also be a significant aesthetic impact associated with construction of a new transmission line to connect to other lines to enable delivery of electricity to Progress Energy's transmission system. Noise and light from the plant would be detectable offsite. The impact of noise and light would be mitigated if the plant is located in an industrial area adjacent to other power plants or industrial land uses. Overall the aesthetic impacts associated with locating at an alternative site would be categorized as MODERATE to LARGE, depending on the site's characteristics. The greatest contributor to this categorization would be the aesthetic impact of the cooling towers and transmission lines.

- Historic and Archaeological Resources

  At the HNP site, a cultural resource inventory would likely be needed for any onsite property that has not been previously surveyed. Other lands, if any, that are acquired to support the plant would also need an inventory of field cultural resources, identification and recording of existing historic and archaeological resources, and possible mitigation of adverse effects from subsequent ground-disturbing actions related to physical expansion of the plant site.

  Before beginning construction at an alternate site, studies would be needed to identify, evaluate, and address mitigation of the potential impacts of new plant construction on cultural resources over the 200 to 400 ha (500 to 1000 ac) necessary for plant construction. The studies would be needed for all areas of potential disturbance at the proposed plant site and along associated corridors where new construction would occur (e.g., roads, transmission corridors, rail lines, or other rights-of-way). Historic and archaeological resource impacts can generally be effectively managed and as such would be. Effects at an undeveloped site would be SMALL to MODERATE.

- Environmental Justice

  No environmental impacts were identified that would result in disproportionately high and adverse environmental impacts on minority and low-income populations if a replacement nuclear plant were built at the HNP site. Some impacts on housing availability and lease prices during construction might occur, and this could disproportionately affect the minority and low-income populations.

  Impacts on minority and low-income populations due to the shutdown of HNP would depend on the number of jobs and the amount of tax revenue lost to the communities surrounding the power plant. Closure of HNP would reduce the overall number of jobs and tax revenue generated in the region that was directly and indirectly attributed to plant operations. However, given the rapid economic growth of Wake County and the Raleigh-Durham area, it is likely that these losses would be replaced by the development of new businesses and new sources of tax revenue in the region. Since CP&L's tax payments represent a small percentage of Wake County's total annual property tax revenue, it is unlikely that social services would be seriously affected. Therefore, minority and low-income populations in the vicinity of HNP would not likely experience any disproportionately high and adverse socioeconomic impacts from the shutdown of HNP.

  The environmental effect of plan shutdown would reduce the amount of operational impacts on the environment. Therefore, minority and low-income populations in the vicinity of HNP would not likely experience any disproportionately high and adverse environmental impacts from the shutdown of HNP.

  Impacts at other sites would depend upon the site chosen and the nearby population distribution, but would be SMALL to MODERATE.

8.2.5 Utility-sponsored Conservation

In the following section, NRC staff will evaluate the environmental impacts of a conservation[(8)] alternative to license renewal. Though CP&L currently employs a variety of conservation, energy efficiency, and other demand-side management measures, the NRC staff finds it reasonable to consider a conservation-based alternative to HNP license renewal based on several recent developments. First, in May 2007, CP&L announced plans to institute utility-based energy efficiency programs aimed at eliminating the need for 2000 MW of electrical generating capacity in the North and South Carolina service territories (Murawski 2007, Beattie

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(8) NRC staff notes that conservation typically refers to all programs that reduce energy consumption, while energy efficiency refers to programs that reduce consumption without reducing services. For this section, NRC staff will use the terms interchangeably.

2007). Second, earlier in the same month, North Carolina's largest utility, Duke Energy Carolinas, indicated that an energy efficiency program would allow it to retire 800 MW of coal capacity, and would allow it to offset up to 1700 MW of capacity over four years (Fordney 2007). Duke also indicated that the cost of the program would be less than the cost of constructing new generation capacity. Third, the North Carolina Utilities Commission released a report in December 2006 indicating that North Carolina has a statewide potential to reduce projected energy consumption by 32.7% of total projected utility sales per year by 2017. The report deemed approximately 25,132 gigawatt-hours (GWh) of this savings (13.9% of statewide electricity sales) to be cost-effectively achievable[(9)] (GDS Associates 2006). Though much of this savings potential likely exists during peak demand times, the magnitude of potential savings significantly exceeds HNP's capacity, and several major efficiency measures identified in the GDS Associates report would affect baseload generation needs. These announcements all indicate robust opportunities for energy efficiency or conservation in North Carolina, as well as costs consistent with other alternatives. As such, NRC staff will evaluate utility-sponsored conservation as a feasible and commercially-available alternative to HNP license renewal. Given the terminology used in the GDS Associates report, in announcements from CP&L, and in the GEIS, NRC staff will use "conservation" and "energy efficiency" interchangeably.

The GEIS notes that a conservation alternative would have mostly SMALL or negligible environmental impacts. NRC staff, in the GEIS, established that resource extraction and material disposal would be the most visible lifecycle impacts, and that some conservation measures may also affect indoor air quality. The GEIS noted, however, that studies had not identified direct impacts from conservation measures to indoor air quality, and that pre-existing contamination is a major determinant in determining post-weatherization pollution levels. The GEIS also noted that production of conservation measures would not require large amounts of materials, and those it does require are common to many manufacturing processes. In addition, the GEIS established that disposal involves normal procedures with sufficiently effective disposal methods and small enough amounts of hazardous compounds that no adverse health effects would result (NRC 1996).

According to the GDS Associates in their *A Study of the Feasibility of Energy Efficiency as an Eligible Resource as Part of a Renewable Portfolio Standard for the State of North Carolina*, conducted for the North Carolina Utilities Commission, energy efficiency potential varies across residential, commercial, and industrial building sectors (GDS Associates 2006). In each sector, GDS provided technical potential (an indication of complete and total implementation of all possible efficiency measures); achievable potential (an implementation level achieved by an aggressively funded and sustained campaign); and achievable cost-effective potential (an implementation level achieved by targeting aggressive and sustained implementation campaigns toward efficiency measures with a lifetime cost of $.05 per kWh or less).

(9) GDS Associates determined $.05 per lifetime kWh produced to be the cost-effectiveness threshold.

In the residential sector, GDS Associates determined that most achievable cost-effective potential energy savings result from a combination of building insulation and weatherization, Energy Star windows, Energy Star programmable thermostats, and compact fluorescent light installation. Other energy reductions come from low-flow shower heads, water heater blankets, and insulation and weatherization programs targeted toward low-income populations. In the commercial sector, improved HVAC controls and motors, higher efficiency lighting and lighting controls, improved refrigeration, better compressed air systems, and upgraded transformers reduce energy consumption. In the industrial sector, improved lighting, motors, pumps, lubricants, controls, and system designs, as well as system optimization and upgraded transformers contribute to increased efficiency (GDS Associates 2006).

GDS Associates' analysis assumed that program administrators would have ten years to implement the programs, reaching full effect by 2017. NRC staff notes that HNP's operating license expires in 2026, and thus would allow for sufficient time to develop a suitable energy efficiency program.

NRC staff discusses the overall impacts of a new nuclear generating alternative in the following sections, and summarizes impacts in Table 8-6.

- Land Use

  Since CP&L would continue to use the existing transmission lines, and would continue to maintain Harris Reservoir, land use impacts of an energy efficiency alternative would be SMALL. It would be possible that equipment replacements would increase waste generation and increased resulting landfill disposal, but given a ten-year timeline for program development and implementation, it would be likely that some proportion of replacements would occur at the end of the existing equipment's life (especially in the case of frequently replaced items, like lightbulbs). Many replaced items (like home appliances or industrial equipment) have substantial recycling value and would likely not be landfilled.

- Ecology

  Ecological impacts would be SMALL, but positive, as withdrawals from and discharges to Harris Reservoir would cease. As no power generation alternative would take the plant's place, water levels in Harris Reservoir may rise and contribute additional water to Buckhorn Creek, which currently is nearly dry for part of the year, and to the Cape Fear River downstream of Harris Reservoir. These impacts would be SMALL, however. Also, there would be SMALL, but positive effects if plant staff stops controlling vegetation at the plant site. If CP&L allowed boat access to the auxiliary reservoir after plant shutdown, aquatic ecology may be affected by potential introduction of invasive species and increased boat traffic as well as fishing access, though this effect would be SMALL, as well.

Table 8-6. Summary of Environmental Impacts of a Conservation Alternative

Impact Category	Impact	Comments
Land Use	SMALL	Existing reservoir, transmission lines remain in use; possible minor, speculative effects on landfill area.
Ecology	SMALL	Withdrawal from and discharge to reservoir ceases; some land may revert to other habitats; fishing may increase in former auxiliary reservoir and invasive species may be introduced, though this would have SMALL effects.
Water Use and Quality—Surface Water	SMALL	Water withdrawal and discharge would cease; additional water may flow into Buckhorn Creek downstream of Harris Reservoir, perhaps reducing stream intermittency.
Water Use and Quality—Groundwater	SMALL	Plant currently uses no groundwater; increased flow may affect groundwater around Buckhorn Creek, but aquifers are not currently used for water supply.
Air Quality	SMALL	Commuter vehicle emissions and diesel emissions would decrease, positively affecting air quality. This effect would be SMALL.
Waste	SMALL	Waste volumes generated by conservation programs would be mitigated by lengthening the program implementation timeline and through recycling. In addition, significance of other waste streams would likely swamp waste generated by an energy efficiency program.
Human Health	SMALL	Changes may occur to indoor air quality, but these are not well-established, and usually stem from pre-existing air quality issues.
Socioeconomics	SMALL	Loss of jobs offset by economic growth in area; speculative potential for additional contractor employment across North Carolina.
Socioeconomics (Transportation)	SMALL	Commuter traffic to the plant would decrease; additional traffic associated with efficiency programs would be widely distributed and would likely not be noticeable.
Aesthetics	SMALL	The existing plant would be decommissioned and an alternative structure would replace it; no noticeable impacts from energy efficiency improvements.
Historic and Archeological Resources	SMALL	No known effects.
Environmental Justice	SMALL	Depending on program design and enrollment, minority and low-income populations could benefit from energy efficiency programs.

- Water Use and Quality

Impacts to water use and quality from an energy efficiency program would be SMALL but positive, as withdrawals from Harris Reservoir would cease. Additional water may be available downstream from HNP in both Buckhorn Creek and the Cape Fear River as the plant would no longer evaporate water for cooling. As the plant uses no groundwater, a conservation alternative would not directly affect groundwater, though increased flow to Buckhorn Creek may affect groundwater in the immediate vicinity. As no one uses this groundwater, the effect would not be noticeable.

- Air Quality

Air quality impacts from a utility-sponsored energy efficiency program would be SMALL and positive. Emissions from commuter vehicles and diesel generators would decrease. The GEIS noted that indoor air quality may suffer from weatherization programs that fail to balance air quality concerns. The GEIS also noted that indoor air quality after weatherization is most strongly affected by pre-existing air quality issues.

- Waste

Waste impacts from energy efficiency programs would likely be SMALL, but somewhat dependent on the nature of the program. Improvements to heating and cooling systems would generate construction wastes, while appliance replacements may also generate wastes. Some of these replacements may occur in the course of normal retirement over the 10-year implementation period and thus constitute no change to normal waste streams. This would be particularly the case for frequently replaced items like light bulbs.

While projections of waste amounts from a conservation program are speculative, statewide equipment replacements and upgrades spread over 10 or more years, many of which would generate several pounds of waste per resident (e.g., lightbulbs, new shower heads, new thermostats), along with some which would generate hundreds to thousands of pounds of waste spread over many residents (replacing commercial ventilation systems or industrial motors), would keep impacts SMALL when compared to the 1.23 MT (1.36 tons) of waste disposed per resident in fiscal year 2005-2006 (NCDENR/DWM 2006). Furthermore, many replacements or upgrades generate waste materials with substantial recycling value (such as metal scrap from appliances, ductwork, and motors) and would thus not increase the burden on landfills. Some wastes, like fluorescent light bulbs, would need to be recycled as they contain hazardous compounds, though they generally operate much longer than their incandescent counterparts. The GEIS noted that amounts of hazardous compounds are small, and disposal methods are effective. Also, facilities to recycle these items currently exist in North Carolina. Waste impacts from the conservation alternative, then, would be SMALL.

- Human Health

  An energy efficiency program is unlikely to have a significant effect on human health. Changes to most building appliances would not affect health, though upgrades to HVAC systems, insulation, and weatherization (including windows) may affect indoor air quality. The GEIS noted that this issue has not been sufficiently studied, but that mitigation measures would be available to correct problems. The GEIS also noted that hazardous chemicals in the waste stream would not affect human health. As such, NRC staff determines that these effects would be SMALL.

- Socioeconomics

  Socioeconomic effects of an energy efficiency program would be SMALL. As in the no-action alternative, loss of jobs at HNP would be offset by economic growth in the area. Additionally, a conservation program would likely employ additional workers, as noted in the GEIS. Low-income populations could benefit from weatherization and insulation programs. This effect would be greater than the effect for the general population because low-income households experience home energy burdens more than four times larger than the average household (OMB 2007). Transportation impacts would also be SMALL as fewer employees commute to the plant site. Any transportation effects from the energy efficiency alternative would be widely distributed across the state, and would not be noticeable.

- Aesthetics

  Impacts from energy efficiency programs would be positive, though small, as the plant is decommissioned and no alternative would replace it. The transmission lines and Harris Reservoir would remain after plant decommissioning. Traffic to the plant would decrease, however, as would the attendant noise and emissions. Noise impacts would occur in instances of upgrades to major building systems, though this impact would be highly intermittent and short-lived.

- Historic and Archaeological Resources

  Impacts to archaeological resources from energy efficiency programs would be SMALL, if any, as a conservation alternative would not affect land use or the historical or cultural resources contained onsite or elsewhere in the state.

- Environmental Justice

  GDS Associates identified weatherization programs targeting low-income residents as a cost-effective energy efficiency option (GDS 2006). Since low-income populations tend to spend a larger proportion of their incomes paying utility bills (according to the Office of Management and Budget, low income populations experience energy burdens more than four times as large as those of average households [OMB 2007]). Impacts to environmental justice from energy efficiency programs would be SMALL, depending on program design and enrollment.

8.2.6 Purchased Electrical Power

CP&L currently relies on purchased power from a variety of generators. In the summer of 2007, CP&L indicated a net purchased power capacity of 1442 MW. Through 2016, CP&L anticipates at least 1147 MW of purchased capacity (Progress Energy 2006a). Thus, NRC staff believes purchased power represents a reasonable alternative to license renewal. In the HNP ER, CP&L indicated that purchased power capacity would likely be available within the Carolinas. Impacts would likely be similar to those of the above generating options; if CP&L's purchased power causes currently existing capacity to operate at higher capacity factors, rather than triggering new construction, then construction stage impacts would be eliminated. It is possible, however, that purchased power would then come from older, less efficient plants, plants with once through cooling, or plants without modern emissions controls. In addition, if power purchased to replace HNP's capacity came from plants built specifically to supply CP&L's needs, the impacts would be the same as for the alternatives already discussed and constructed at alternate sites. As such, impacts are difficult to quantify, though likely similar to other alternatives considered in Sections 8.2.1 through 8.2.5 in this draft SEIS, as well as in the GEIS.

Given the location of HNP, it would be unlikely that CP&L would be able to purchase power from Canada or Mexico to replace HNP's capacity, regardless of whether either country has sufficient existing export capacity.

Since purchased power may come from a variety of generating resources, including coal, natural gas, nuclear, hydroelectric, and perhaps oil-fired installations, NRC staff believes impacts from the purchased power alternative would be generally greater than the impacts of license renewal, and similar to impacts of the other generation alternatives staff considered in this section.

8.2.7 Other Alternatives

Other generation technologies NRC staff considered but determined to be individually inadequate to serve as alternatives to HNP are discussed in the following paragraphs.

8.2.7.1 Oil-Fired Generation

EIA projects that oil-fired plants will account for very little of the new generation capacity in the United States during the 2007 to 2030 time period, and overall oil consumption for electricity generation will decrease because of higher fuel costs and lower efficiencies (DOE/EIA 2007).

Oil-fired generation is more expensive to operate than nuclear or coal-fired plants, though it is less expensive than either to construct. Future increases in oil prices are expected to make oil-fired generation increasingly more expensive than coal-fired generation. The high cost of oil has prompted a steady decline for use in electricity generation. For these reasons, oil-fired generation will not be evaluated at an alternative to HNP license renewal.

8.2.7.2 Wind Power

Wind power, by itself, is not suitable for large base-load capacity. As discussed in Section 8.3.1 of the GEIS, wind has a high degree of intermittency, and average annual capacity factors for wind plants are relatively low (of the order of 30 to 40 percent). Wind power, in conjunction with energy storage mechanisms or another, readily dispatchable power source, like hydropower, might serve as a means of providing base-load power. However, current energy storage technologies are too expensive for wind power to serve as a large base-load generator, and opportunities to pair a sufficient volume of wind with hydropower do not exist in North Carolina (INEEL 1997).

The State of North Carolina is mostly a wind power Class 1 region, though some areas, particularly along ridgelines in the western part of the state, contain wind resources in Classes 4 through 7. Offshore areas in the east also offer wind power potential, and some areas provide wind classes ranging from 4 to 6 (DOE/NREL 2007a). While wind turbines tend to be economical in wind resources Class 4 and above, both ridgeline and coastal areas of the state are protected by state law, under the Mountain Ridge Protection Act (MRPA) and the Coastal Area Management Act, respectively (Bell 2006). La Capra Associates, in its 2006 report to the North Carolina Utilities Commission, indicated 500 MW of practical wind potential in North Carolina if one excludes prohibited western wind resources (La Capra 2006). Should interpretation of the MRPA change in the future, 1000 MW of additional practical wind potential is available in western North Carolina.

Given limitations on potential wind power sites, as well as relatively low capacity factors, NRC staff does not consider wind power to be a suitable stand-alone alternative to HNP license renewal. NRC staff does, however, recognize that North Carolina likely has utility-scale wind resources, and will include wind power in a combination alternative addressed in Section 8.2.8.

8.2.7.3 Solar Power

Solar technologies use the sun's energy to produce electricity. Currently, the HNP site receives an average of 4.5 to 5 kWh of solar radiation per square meter per day, as does much of the state of North Carolina (DOE 2007). Since photovoltaic cells, the most likely alternative given North Carolina's potential, tend to be roughly 15% efficient, a solar-powered alternative would require approximately at least 2390 ha (5910 ac) to provide an equivalent amount of electricity to that generated by gas- and coal-fired alternatives (DOE/NREL 2006). In the GEIS, the NRC staff noted that solar power is intermittent; therefore, additional collectors would be necessary to account for shading. In addition, a solar powered alternative would require energy storage or a backup power supply to provide electric power at night. Solar power is currently significantly more costly than most other alternatives for a given amount of capacity, and as adding energy storage technologies only increases the cost of solar power, NRC staff will not evaluate solar power in-depth as a feasible alternative to license renewal of HNP.

8.2.7.4 Hydropower

The Idaho National Energy and Environmental Laboratory (INEEL) estimates that North Carolina has 508 MW of technically available, undeveloped hydroelectric resources (INEEL 1997). This amount occurs entirely in installations of 100 MW or less. This potential is 44% less than HNP's capacity, and thus is insufficient to serve as an alternative to license renewal. As such, hydropower would not be considered as a feasible alternative to HNP license renewal.

8.2.7.5 Geothermal Energy

Geothermal plants are most likely to be sited in the western continental United States, Alaska, and Hawaii where hydrothermal reservoirs are prevalent (NRC 1998). There is no feasible eastern location for geothermal capacity to serve as an alternative to HNP. As such, NRC staff concludes that geothermal energy would not be a feasible alternative to renewal of the HNP operating license.

8.2.7.6 Wood Waste

DOE notes that North Carolina has good biomass resource potential (DOE 2007). Pulp, paper, and paperboard industries in North Carolina consume wood and wood waste for energy production.

In 1999, DOE researchers estimated that North Carolina has biomass fuel resources consisting of urban, mill, agricultural and forest residues, as well as speculative potential for energy crops. Excluding potential energy crops, DOE projected that North Carolina had 8,367,600 MT (9,223,700 tons) of plant-based biomass at $50 a ton delivered (Walsh et al. 1999; costs are in

1995 dollars). The National Renewable Energy Laboratory estimates that each dry ton of wood residue produces approximately 1100 kWh of electricity (DOE/NREL 2004). Assuming this conversion efficiency, using all biomass available in North Carolina at $50 per ton would generate roughly 10 TWh of electricity. This is greater than the output of HNP (operating at a 0.9 capacity factor) by roughly 43%. Walsh notes, however, that these estimates of biomass capacity contain substantial uncertainty, and that potential availability does not mean they would actually be available at the prices indicated or that resources would be free of contamination. Some of these plant wastes already have reuse value, and would likely be more costly to deliver. Others, such as forest residues, may prove unsafe and unsustainable to harvest on a regular basis.

While the GEIS notes that wood-waste plants are able to operate in a baseload duty cycle, the larger wood-waste power plants are currently only 40 to 50 MWe in size. Thus, up to 23 wood waste plants may be necessary to replace the capacity of HNP. Estimates in the GEIS suggest that the overall level of construction impact per MW of installed capacity would be approximately the same as that for a coal-fired plant, although facilities using wood waste for fuel would be built at smaller scales. Like coal-fired plants, wood-waste plants require large areas for fuel storage and processing and involve the same type of combustion equipment.

NRC staff believes North Carolina has utility-scale wood waste resources, but given uncertainties in supply estimates, as well as the small size and high number of installed facilities necessary to replace HNP, NRC staff does not believe wood biomass is a suitable alternative to HNP license renewal. NRC staff will include wood waste facilities in a combination alternative addressed in Section 8.2.8.

8.2.7.7 Municipal Solid Waste

Currently there are approximately 89 waste-to-energy plants operating in the United States. These plants generate approximately 2700 MWe, or an average of approximately 30 MWe per plant (Integrated Waste Services Association 2007). Assuming average size waste incinerators, approximately 30 plants would be necessary to replace HNP.

Estimates in the GEIS suggest that the overall level of construction impact from a waste-fired plant would be approximately the same as that for a coal-fired plant. Additionally, waste-fired plants have the same or greater operational impacts than coal-fired technologies (including impacts on the aquatic environment, air, and waste disposal). The initial capital costs for municipal solid waste plants are greater than for comparable steam turbine technology at coal facilities or at wood waste facilities, due to the need for specialized waste separation and handling equipment (NRC 1996).

The decision to burn municipal waste to generate energy is usually driven by the need for an alternative to landfills rather than by energy considerations. The use of landfills as a waste disposal option is likely to increase in the near term; with energy prices increasing, however, it is possible that municipal waste combustion facilities may become attractive again.

Regulatory structures that once supported municipal solid waste incineration no longer exist. For example, the Tax Reform Act of 1986 made capital-intensive projects such as municipal waste combustion facilities more expensive relative to less capital-intensive waste disposal alternative such as landfills. Also, the 1994 Supreme Court decision *C&A Carbone, Inc. v. Town of Clarkstown* struck down local flow control ordinances that required waste to be delivered to specific municipal waste combustion facilities rather than landfills that may have had lower fees. In addition, increasingly stringent environmental regulations have increased the capital cost necessary to construct and maintain municipal waste combustion facilities (DOE/EIA 2001).

Given the small average installed size of municipal solid waste plants and unfavorable regulatory environment, NRC staff does not consider municipal solid waste combustion to be a feasible alternative to license renewal.

8.2.7.8 Other Biomass Derived Fuels

In addition to wood and municipal solid-waste fuels, there are several other concepts for fueling electric generators, including burning crops, converting crops to a liquid fuel such as ethanol, and gasifying crops (including wood waste). In the GEIS, the NRC staff points out that none of these technologies has progressed to the point of being competitive on a large scale or of being reliable enough to replace a baseload plant such as HNP. For these reasons, such fuels do not offer a feasible alternative to renewal of the HNP operating license.

8.2.7.9 Fuel Cells

Fuel cells work without combustion and the accompanying environmental side effects. Power is produced electrochemically by passing a hydrogen-rich fuel over an anode and air (or oxygen) over a cathode and separating the two by an electrolyte. The only by-products are heat, water, and carbon dioxide. Hydrogen fuel can come from a variety of hydrocarbon resources by subjecting them to steam under pressure. Natural gas is typically used as the source of hydrogen.

At the present time, fuel cells are not economically or technologically competitive with other alternatives for baseload electricity generation. EIA projects that by 2008, fuel cells will cost $3,787 per installed kW, and projects a 10 MWe unit size (DOE/EIA 2006b). While it may be possible to use a distributed array of fuel cells to provide an alternative to HNP, it would be extremely costly to do so.

8.2.7.10 Delayed Retirement

CP&L has no plans to retire any generating units at this time (Progress Energy 2006a), and thus delayed retirement would not be a feasible alternative to license renewal.

8.2.8 Combination of Alternatives

Even though individual alternatives to license renewal might not be sufficient on their own to replace the capacity of HNP due to the small size of the resource or lack of cost-effective opportunities, it is conceivable that a combination of alternatives might be cost-effective.

There are many possible combinations of alternatives. NRC staff believes a combination that includes, for example, 293 MWe of combined-cycle natural gas-fired capacity, six 50-MW biomass-fired plants, a 100 MWe wind park, and 250 MW of conservation programs would provide an alternative that roughly approximates the amount of power produced by HNP with some degree of overcapacity to compensate for wind capacity factors. The biomass-fired plants would operate on wood residues and would exist throughout the state, while the natural gas combined-cycle plant would operate at the HNP site or at an alternate site.

The GEIS indicates that wood-fired plants would serve baseload capacity, but that they tend to operate at low efficiencies and are economic only when feedstocks are very inexpensive. In addition, the GEIS notes that gathering fuel for wood-fired plants can have significant environmental impacts. NRC staff believes it is likely that 300 MWe of wood-fired generation would have SMALL to MODERATE impacts, depending on the fuel source. If the plants were widely distributed and feedstocks were primarily pre-existing waste streams, operational impacts would be SMALL. Construction impacts of six wood-fired plants would be SMALL to MODERATE depending on plant cooling configurations and plant locations. These impacts would be mitigated by locating plants on previously disturbed land near other industrial applications, including paper/pulp mills or other forest-products operations.

Siting a single, 293 MWe gas-fired unit at the HNP site would likely have SMALL impacts, similar to, but smaller than those of the gas-fired alternative NRC staff considered in Section 8.2.3. Initiating 250 MW of conservation programs would have overall SMALL impacts, as determined for a larger amount of conservation capacity in Section 8.2.5.

NRC staff notes that it may be difficult to site 100 MW of wind capacity in North Carolina (Bell 2006), but such a project may be possible in unrestricted areas, such as land on the western sides of North Carolina's sounds. A 100 MW wind park using 1.5 MW turbines (a common commercially available size) would require roughly 6.9 to 14 ha (17 to 35 ac) of land for turbine footprints based on DOE's Wind Farm Area Calculator (DOE/NREL 2007b), with some additional land use for infrastructure. The total area for the park would be larger, but land between turbines would continue to be used for agricultural purposes. Construction impacts for the 67 turbines required would be SMALL to MODERATE, depending on the amount of land disturbance required for installation.

The impacts of this alternative would be mostly SMALL, though potential exists for several MODERATE impacts. Therefore, the impact of this combination alternative would be greater than impacts of continued HNP operation or of the conservation alternative.

8.3 Summary of Alternatives Considered

NRC staff considered alternative actions including the no-action alternative (discussed in Section 8.1), new generation or conservation alternatives (coal-fired supercritical and IGCC generation, natural gas, nuclear, and conservation alternatives discussed in Sections 8.2.1 through 8.2.5, respectively), purchased electrical power (discussed in Section 8.2.6), alternative technologies NRC staff considered inadequate to serve as alternatives (discussed in Section 8.2.7), and a combination of alternatives (discussed in Section 8.2.8).

As established in the GEIS, the need for power from HNP is assumed by NRC in the license renewal process. Should NRC not renew HNP's license, this amount of generating capacity or load reduction would have to come from an alternative to license renewal. In addition, even if NRC renews the HNP operating license, CP&L could elect to meet this need with an alternative other than continued HNP operation. Decisions about which alternative to implement, regardless of whether NRC renews the HNP operating license, are left to utility and state-level decisionmakers (or non-NRC Federal level decisionmakers) where applicable.

The environmental impacts from most alternatives to license renewal that NRC staff considered would be greater than the impacts of continued HNP operation under a renewed license, which would have all SMALL impacts except for collective offsite radiological impacts from the fuel cycle and from high-level waste (HLW) and spent fuel disposal. The conservation alternative to HNP renewal, however, also has all SMALL impacts, and some of these impacts are likely to be smaller than the impacts of HNP license renewal.

The NRC staff concludes, then, that conservation has the lowest levels of environmental impact among all alternatives considered. Thus, conservation is the environmentally preferred alternative to the proposed federal action of renewing the HNP operating license.

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10 CFR 51. Code of Federal Regulations, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Functions."

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9.0 SUMMARY AND CONCLUSIONS

By letter dated November 14, 2006, Carolina Power and Light Company, doing business as Progress Energy Carolinas, Inc., (CP&L) submitted an application to the U.S. Nuclear Regulatory Commission (NRC) to renew the operating license (OL) for the Shearon Harris Nuclear Power Plant, Unit 1 (HNP) for an additional 20-year period. If the OL is renewed, State regulatory agencies and CP&L will ultimately decide whether the plant will continue to operate based on factors such as the need for power or other matters within the State's jurisdiction or the purview of the owners. If the OL is not renewed, then the plant must be shut down on or before the expiration date of the current OL, which is October 24, 2026.

Section 102 of the National Environmental Policy Act (NEPA) (42 USC 4321) directs that an environmental impact statement (EIS) is required for major Federal actions that significantly affect the quality of the human environment. The NRC has implemented Section 102 of NEPA in Part 51 of Title 10 of the *Code of Federal Regulations* (10 CFR Part 51). Part 51 identifies licensing and regulatory actions that require an EIS. In 10 CFR 51.20(b)(2), the Commission requires preparation of an EIS or a supplement to an EIS for renewal of a reactor OL; 10 CFR 51.95(c) states that the EIS prepared at the OL renewal stage will be a supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999).(1)

Upon acceptance of the CP&L application, the NRC began the environmental review process described in 10 CFR Part 51 by publishing on March 20, 2007, a Notice of Intent to prepare an EIS and conduct scoping (NRC 2007b). The NRC staff held public scoping meetings on April 18, 2007, in Apex, North Carolina (NRC 2007c), and conducted a site audit at HNP in June 2007 (NRC 2007d). In the preparation of this draft supplemental environmental impact statement (SEIS) for HNP, the NRC staff reviewed the CP&L Environmental Report (ER) and compared it to the GEIS, consulted with other agencies, conducted an independent review of the issues following the guidance set forth in NUREG-1555, Supplement 1, *Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal* (NRC 2000), and considered the public comments received during the scoping process. The NRC staff also considered the public comments received during the scoping process for preparation of this draft SEIS for HNP (NRC 2007a). The public comments received during the scoping process that were considered to be within the scope of the environmental review are provided in Appendix A, Part 1, of this draft SEIS.

The NRC staff will hold two public meetings in Apex, North Carolina, in January 2008, to describe the preliminary results of the NRC environmental review, to answer questions, and to provide members of the public with information to assist them in formulating comments on this

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(1) The GEIS was issued in 1996, and Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to GEIS include Addendum 1.

draft SEIS. When the comment period ends, the NRC staff will consider and address all of the comments received. These comments will be addressed in Appendix A, Part 2, of the final SEIS.

This draft SEIS includes the NRC staff's preliminary analysis that considers and weighs the environmental effects of the proposed action, including cumulative impacts, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse effects. This draft SEIS also includes the NRC staff's preliminary recommendation regarding the proposed action.

The NRC has adopted the following statement of purpose and need for license renewal from the GEIS:

> The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and, where authorized, Federal (other than NRC) decision makers.

The evaluation criterion for the NRC staff's environmental review, as defined in 10 CFR 51.95(c)(4) and the GEIS, is to determine

> ... whether or not the adverse environmental impacts of license renewal are so great that preserving the option of license renewal for energy planning decision makers would be unreasonable.

Both the statement of purpose and need and the evaluation criterion implicitly acknowledge that there are factors, in addition to license renewal, that will ultimately determine whether an existing nuclear power plant continues to operate beyond the period of the current OL.

NRC regulations (10 CFR 51.95(c)(2)) contain the following statement regarding the content of SEISs prepared at the license renewal stage:

> The supplemental environmental impact statement for license renewal is not required to include discussion of need for power or the economic costs and economic benefits of the proposed action or of alternatives to the proposed action except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation. In addition, the supplemental environmental impact statement prepared at the license renewal stage need not discuss other issues not related to the environmental effects of the proposed action and the alternatives, or any aspect of the storage of spent fuel for the facility within the scope of the generic determination in § 51.23(a) and in accordance with § 51.23(b).

The GEIS contains the results of a systematic evaluation of the consequences of renewing an OL and operating a nuclear power plant for an additional 20 years. It evaluates 92 environmental issues using the NRC's three-level standard of significance—SMALL, MODERATE, or LARGE—developed using the Council on Environmental Quality guidelines. The following definitions of the three significance levels are set forth in the footnotes to Table B-1 of 10 CFR Part 51, Subpart A, Appendix B:

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

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

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

For 69 of the 92 issues considered in the GEIS, the NRC staff analysis in the GEIS shows the following:

(1) The environmental impacts associated with the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics.

(2) A single significance level (i.e., SMALL, MODERATE, or LARGE) has been assigned to the impacts (except for collective off-site radiological impacts from the fuel cycle and from high-level waste [HLW] and spent fuel disposal).

(3) Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not to be sufficiently beneficial to warrant implementation.

These 69 issues were identified in the GEIS as Category 1 issues. In the absence of new and significant information, the NRC staff relied on conclusions in the GEIS for issues designated Category 1 in Table B-1 of 10 CFR Part 51, Subpart A, Appendix B. The NRC staff also determined that information provided during the public comment period did not identify any new issue that requires site-specific assessment.

Of the 23 issues that do not meet the criteria set forth above, 21 are classified as Category 2 issues requiring analysis in a plant-specific supplement to the GEIS. The remaining two issues, environmental justice and chronic effects of electromagnetic fields, were not categorized. Environmental justice was not evaluated on a generic basis in the GEIS and must be addressed in the draft SEIS. Information on the chronic effects of electromagnetic fields was not conclusive at the time the GEIS was prepared.

This draft SEIS documents the NRC staff's consideration of all 92 environmental issues identified in the GEIS. The NRC staff considered the environmental impacts associated with alternatives to license renewal and compared the environmental impacts of license renewal and the alternatives. The alternatives to license renewal that were considered include the no-action alternative (not renewing the OL for HNP) and alternative methods of power generation. These alternatives were evaluated assuming that the replacement power generation plant is located at either the HNP site or some other unspecified location.

9.1 Environmental Impacts of the Proposed Action-License Renewal

The NRC staff has an established process for identifying and evaluating the significance of any new information on the environmental impacts of license renewal. No information has been identified as being new and significant related to Category 1 issues that would call into question the conclusions in the GEIS. Similarly, no new environmental issues applicable to HNP were identified by the NRC staff through its review process or the public scoping process. Therefore, the NRC staff relies upon the conclusions of the GEIS for all Category 1 issues that are applicable to HNP.

CP&L's ER presents an analysis of the Category 2 issues that are applicable to HNP, plus environmental justice. The NRC staff has reviewed the CP&L analysis for each issue and has conducted an independent review of each issue plus environmental justice. Nine Category 2 issues are not applicable because they are related to plant design features or site characteristics not found at HNP. Three Category 2 issues are not discussed in this draft SEIS because they are specifically related to refurbishment. CP&L has stated that its evaluation of structures and components, as required by 10 CFR 54.21, did not identify any major plant refurbishment activities or modifications as necessary to support the continued operation of HNP, for the license renewal period. In addition, any replacement of components or additional inspection activities are within the bounds of normal plant component replacement and, therefore, are not expected to affect the environment outside of the bounds of the plant operations evaluated in the *Final Environmental Statement Related to Operation of Shearon Harris Nuclear Power Plant* (NRC 1983).

Eight Category 2 issues related to operational impacts and postulated accidents during the renewal term, as well as environmental justice and chronic effects of electromagnetic fields, are discussed in detail in this draft SEIS. Five of the Category 2 issues and environmental justice apply to both refurbishment and to operation during the renewal term and are only discussed in this draft SEIS in relation to operation during the renewal term. For all eight Category 2 issues and environmental justice, the NRC staff concludes that the potential environmental effects are of SMALL significance in the context of the standards set forth in the GEIS. In addition, the NRC staff determined that appropriate Federal health agencies have not reached a consensus on the existence of chronic adverse effects from electromagnetic fields. Therefore, no further evaluation of this issue is required. For severe accident mitigation alternatives (SAMAs), the

NRC staff concludes that a reasonable, comprehensive effort was made to identify and evaluate SAMAs. Based on its review of the SAMAs for HNP, and the plant improvements already made, the NRC staff concludes that several candidate SAMAs are potentially cost-beneficial. However, none of these SAMAs relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to 10 CFR Part 54.

Mitigation measures were considered for each Category 2 issue. For most issues, current measures to mitigate the environmental impacts of plant operation were found to be adequate.

Cumulative impacts of past, present, and reasonably foreseeable future actions were considered, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. For purposes of this analysis, where HNP license renewal impacts are deemed to be SMALL, the NRC staff concluded that these impacts would not result in significant cumulative impacts on potentially affected resources.

The following sections discuss unavoidable adverse impacts, irreversible or irretrievable commitments of resources, and the relationship between local short-term use of the environment and long-term productivity.

9.1.1 Unavoidable Adverse Impacts

An environmental review conducted at the license renewal stage differs from the review conducted in support of a construction permit because the plant is in existence at the license renewal stage and has operated for a number of years. As a result, adverse impacts associated with the initial construction have been avoided, have been mitigated, or have already occurred. The environmental impacts to be evaluated for license renewal are those associated with refurbishment and continued operation during the renewal term.

The adverse impacts of continued operation identified are considered to be of SMALL significance. The adverse impacts of likely power-generation alternatives if HNP ceases operation at or before the expiration of the current OL will not be smaller than those associated with continued operation of this unit, and they may be greater for some impact categories in some locations.

9.1.2 Irreversible or Irretrievable Resource Commitments

The commitment of resources related to construction and operation of the HNP during the current license period was made when the plant was built. The resource commitments to be considered in this draft SEIS are associated with continued operation of the plant for an additional 20 years. These resources include materials and equipment required for plant maintenance and operation, the nuclear fuel used by the reactors, and ultimately, permanent offsite storage space for the spent fuel assemblies.

The likely power-generation alternatives if HNP ceases operation on or before the expiration of the current OL will require a commitment of resources for construction of the replacement plants as well as for fuel to run the plants.

9.1.3 Short-Term Use Versus Long-Term Productivity

An initial balance between short-term use and long-term productivity of the environment at the HNP site was set when the plant was approved and construction began. That balance is now well established. Renewal of the OL for HNP and continued operation of the plant will not alter the existing balance but may postpone the availability of the site for other uses. Denial of the application to renew the OL will lead to shutdown of the plant and will alter the balance in a manner that depends on subsequent uses of the site. For example, the environmental consequences of turning the HNP site into a park or an industrial facility are quite different.

9.2 Relative Significance of the Environmental Impacts of License Renewal and Alternatives

The proposed action is renewal of the OL for HNP. Chapter 2 describes the site, power plant, and interactions of the plant with the environment. As noted in Chapter 3, no refurbishment and no refurbishment impacts are expected at HNP. Chapters 4 through 7 discuss environmental issues associated with renewal of the OL. Environmental issues associated with the no-action alternative and alternatives involving power generation and conservation are discussed in Chapter 8.

The significance of the environmental impacts from the proposed action (approval of the application for renewal of the OL), the no-action alternative (denial of the application), alternatives involving nuclear, gas-fired or coal-fired generation of power at the HNP site and an unspecified “alternate site,” and a combination of alternatives are compared in Table 9-1. Continued use of a closed-cycle cooling system at the HNP site is assumed for Table 9-1.

Table 9-1 shows that the significance of the environmental effects of the proposed action is SMALL for all impact categories (except for collective offsite radiological impacts from the fuel cycle and from high-level waste and spent fuel disposal, for which a single significance level was not assigned [see Chapter 6]). Similarly, the environmental effects of the no-action and conservation alternatives are SMALL for all impact categories. Other considered power-generating alternative actions may have environmental effects in at least some impact categories that reach MODERATE or LARGE significance.

Table 9-1. Summary of Environmental Significance of License Renewal, the No Action Alternative, and Other Alternatives

Impact Category	Proposed Action License Renewal	No-Action Alternative Denial of Renewal	Coal-Fired Generation		IGCC Coal-Fired Generation	
			HNP Site	Alternate Site	HNP Site	Alternate Site
Land Use	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Ecology	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Water Use and Quality – Surface Water	SMALL	SMALL	SMALL to MODERATE	MODERATE to LARGE	SMALL to MODERATE	SMALL to LARGE
Water Use and Quality–Groundwater	SMALL	SMALL	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE
Air Quality	SMALL	SMALL	SMALL to MODERATE	SMALL to LARGE	SMALL to MODERATE	SMALL to LARGE
Waste	SMALL[(a)]	SMALL	SMALL	SMALL	SMALL	SMALL
Human Health	SMALL	SMALL	MODERATE	MODERATE	SMALL	SMALL to MODERATE
Socioeconomics	SMALL	SMALL	MODERATE	MODERATE	MODERATE	MODERATE
Transportation	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Aesthetics	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Historic & archaeological Resources	SMALL	SMALL	SMALL to MODERATE	MODERATE to LARGE	SMALL to MODERATE	MODERATE to LARGE
Environmental Justice	SMALL	SMALL	MODERATE	MODERATE to LARGE	MODERATE	MODERATE to LARGE

(a) Except for collective offsite radiological impacts from the fuel cycle and from HLW and spent fuel disposal, for which a significance level was not assigned. See Chapter 6 for details

Table 9-1. Summary of Environmental Significance of License Renewal, the No Action Alternative, and Other Alternatives

Impact Category	Proposed Action License Renewal	Conservation	Natural Gas-Fired Generation		New Nuclear Power Generation	
			HNP Site	Alternative Site	HNP Site	Alternate Site
Land Use	SMALL	SMALL	SMALL to MODERATE	SMALL to LARGE	MODERATE	MODERATE to LARGE
Ecology	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	MODERATE
Water Use and Quality – Surface Water	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Water Use and Quality– Groundwater	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Air Quality	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL	SMALL
Waste	SMALL	SMALL	SMALL	SMALL	SMALL	SMALL
Human Health	SMALL[(a)]	SMALL	SMALL	SMALL	SMALL	SMALL
Socioeconomics	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	SMALL to LARGE
Transportation	SMALL	SMALL	SMALL to MODERATE	SMALL to MODERATE	MODERATE	SMALL to LARGE
Aesthetics	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	MODERATE to LARGE
Historic & archaeological Resources	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE
Environmental Justice	SMALL	SMALL	SMALL	SMALL to MODERATE	SMALL	SMALL to MODERATE

(a) Except for collective offsite radiological impacts from the fuel cycle and from HLW and spent fuel disposal, for which a significance level was not assigned. See Chapter 6 for details.

9.3 NRC Staff Conclusions and Recommendations

Based on (1) the analysis and findings in the GEIS, (2) the ER submitted by CP&L, (3) consultation with Federal, State, and local agencies, (4) the NRC staff's own independent review, and (5) the NRC staff's consideration of public comments received, the preliminary recommendation of the NRC staff is that the Commission determine that the adverse environmental impacts of license renewal for HNP are not so great that preserving the option of license renewal for energy planning decision makers would be unreasonable.

9.4 References

10 CFR Part 51. *Code of Federal Regulations*, Title 10, *Energy*, Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."

10 CFR Part 54. *Code of Federal Regulations*, Title 10, *Energy*, Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

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U.S. Nuclear Regulatory Commission (NRC). 1999. Generic Environmental Impact Statement for License Renewal of Nuclear Plants Main Report, "Section 6.3 – Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants, Final Report." NUREG-1437, Volume 1, Addendum 1. Office of Nuclear Regulatory Research, Washington, D.C.

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U.S. Nuclear Regulatory Commission (NRC). 2007b. “Notice of Opportunity for Hearing and Notice of Intent to prepare an Environmental Impact Statement and Conduct Scoping Process of Facility Operating License No. NPF-63 for an Additional 20-year Period, Carolina Power and Light Company, Shearon Harris Nuclear Power Plant.” Federal Register: Vol. 72, No. 53, pp. 13139-13142. Washington, D.C. Accessible at ML070790140.

U.S. Nuclear Regulatory Commission (NRC). 2007c. “Summary of public meetings related to the review of the Shearon Harris nuclear power plant license renewal application.” Accessible at ML071200434.

U.S. Nuclear Regulatory Commission (NRC). 2007d. “Summary of site audit related to the review of the license renewal application for Shearon Harris nuclear power plant, Unit 1.” Accessible at ML071700428.

Appendix A

Comments Received on the Environmental Review

Appendix A:

Comments Received on the Environmental Review

Part I – Comments Received During Scoping

On March 20, 2007, the U.S. Nuclear Regulatory Commission (NRC) published a Notice of Intent in the *Federal Register* (72 FR 13139) to notify the public of the NRC staff's intent to prepare a plant-specific supplement to the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999),[a] related to the renewal application for the Shearon Harris Nuclear Power Plant (HNP) operating license and to conduct scoping. This plant-specific supplement to the GEIS has been prepared in accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) guidance, and Title 10 of the *Code of Federal Regulations*, Part 51 (10 CFR Part 51). As outlined by NEPA, the NRC initiated the scoping process with the issuance of the *Federal Register* Notice. The NRC invited the applicant; Federal, State, and local government agencies; Native American tribal organizations; local organizations; and individuals to participate in the scoping process by providing oral comments at the scheduled public meetings and/or submitting comments by May 19, 2007.

The scoping process included two public scoping meetings, which were held at the New Horizons Fellowship in Apex, North Carolina, on April 18, 2007. The NRC issued press releases and announced the meetings in local newspapers. Approximately 180 members of the public attended the meetings. Both sessions began with NRC staff members providing a brief overview of the license renewal process. Following the NRC's prepared statements, the meetings were open for public comments. Thirty-four attendees provided either oral comments or written statements that were recorded and transcribed by a certified court reporter. The meetings transcripts can be found as an attachment to the meeting summary, which was issued on May 14, 2007 (meeting transcripts, ML071300371 and ML071300377; meeting summary, ML071200434). The documents are publicly available and can be found at the Agencywide Documents Access and Management System (ADAMS) at http://adamswebsearch.nrc.gov/dologin.html or through the NRC's Electronic Reading Room link at http://www.nrc.gov. Persons who do not have access to ADAMS or who encounter problems in accessing the documents located in ADAMS should contact the NRC's Public Document Room staff at 1-800-397-4209, or 301-415-4737, or by e-mail at pdr@nrc.gov.

At the conclusion of the scoping period, the NRC staff reviewed the transcripts and all written material received and identified individual comments. Each set of comments from a given

(1) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

commenter was given a unique alpha identifier (Commenter ID letter), allowing each set of comments from a commenter to be traced back to the transcript, letter, or email in which the comments were submitted. Specific comments were numbered sequentially within each comment set. All of the comments received and the NRC staff responses are included in the HNP Scoping Summary Report dated August 9, 2007 (ML071980195).

Comments were consolidated and categorized according to the topic within the proposed supplement to the GEIS or according to the general topic if outside the scope of the GEIS. Comments with similar specific objectives were combined to capture the common essential issues that had been raised in the source comments. Once comments were grouped according to subject area, the NRC staff determined the appropriate action for the comment.

Table A-1 identifies the individuals who provided comments applicable to the environmental review and the Commenter ID associated with each person's set(s) of comments. The individuals are listed in the order in which they spoke at the public meeting, and in the alphabetical order for the comments received by letter. To maintain consistency with the Scoping Summary Report, the unique identifier used in that report for each set of comments is retained in this appendix. The Commenter ID is preceded by HNP, which stands for Shearon Harris Nuclear Power Plant. Accession numbers indicate the location of the written comments in ADAMS.

The comments fall into one of the following general groups:

- Specific comments that address environmental issues within the purview of the NRC environmental regulations related to license renewal. These comments address Category 1 or Category 2 issues or issues that were not addressed in the GEIS. They also address alternatives and related Federal actions.

- General comments (1) in support of or opposed to nuclear power or license renewal or (2) on the renewal process, the NRC's regulations, and the regulatory process. These comments may or may not be specifically related to the HNP license renewal application.

- Questions that do not provide new information.

- Specific comments that address issues that do not fall within or are specifically excluded from the purview of NRC environmental regulations related to license renewal. These comments typically address issues such as the need for power, emergency preparedness, security, current operational safety issues, and safety issues related to operation during the renewal period.

Comments applicable to this environmental review and the NRC staff's responses are summarized in this appendix. The parenthetical alpha-numeric identifier after each comment refers to the comment set (Commenter ID) and the comment number. This information, which was extracted from the HNP Scoping Summary Report, is provided for the convenience of those interested in the scoping comments applicable to this environmental review. The ADAMS accession number for the Scoping Summary Report is ML071980195.

Comments in this section are grouped into the following categories:

A.1.1 Request for Information
A.1.2 Opposition to Nuclear Power
A.1.3 Support for Nuclear Power
A.1.4 License Renewal and Its Processes
A.1.5 Opposition to License Renewal at Shearon Harris Nuclear Power Plant, Unit 1
A.1.6 Support for License Renewal at Shearon Harris Nuclear Power Plant, Unit 1
A.1.7 Water Quality and Use Issues
A.1.8 Human Health Issues
A.1.9 Socioeconomic Issues
A.1.10 Uranium Fuel Cycle and Waste Management Issues
A.1.11 Alternatives
A.1.12 Environmental Justice
A.1.13 Global Warming
A.1.14 Issues Outside the Scope of License Renewal: Operational Safety, Security, & Emergency Preparedness; Safeguards and Security; Need for Power; and Cost of Power

Table A-1. Individuals Providing Comments During Scoping Comment Period

Commenters ID	Commenter	Affiliation (If Stated)	Comment Source and ADAMS Accession Number[a]
HNP-A	John Rukavina	Director of Public Safety, Wake County	Afternoon Scoping Meeting
HNP-B	Lynn Bauchkey	Local Citizen	Afternoon Scoping Meeting
HNP-C	Herman Jaffe	Local Citizen	Afternoon Scoping Meeting
HNP-D	David McNellis	Research Professor, University of North Carolina, Chapel Hill	Afternoon Scoping Meeting
HNP-E	John Byrne	Mayor, Fuquay-Varina	Afternoon Scoping Meeting
HNP-F	Paul Fisher	Alderman, City of Southport; Chairman, North Carolina Municipal Power Agency	Afternoon Scoping Meeting

Commenters ID	Commenter	Affiliation (If Stated)	Comment Source and ADAMS Accession Number[(a)]
HNP-G	Robert J. Ahlert	Mayor pro tem, Town of Clayton	Afternoon Scoping Meeting
HNP-H	David Finger	Chairman, Cary Chamber of Commerce Board of Directors	Afternoon Scoping Meeting
HNP-I	Scoop Green	Executive Director, Holly Springs Chamber of Commerce	Afternoon Scoping Meeting
HNP-J	Harvey Schmitt	President, Greater Raleigh Chamber of Commerce	Afternoon Scoping Meeting
HNP-K	Liz Cullington	Local Citizen	Afternoon Scoping Meeting
HNP-L	Michael Leach	Raleigh-Apex branch of the National Association for the Advancement of Colored People (NAACP)	Afternoon Scoping Meeting
HNP-M	Robert Duncan	Site Vice President, HNP	Afternoon Scoping Meeting
HNP-N	Keith Sutton	President, Triangle Urban League	Afternoon Scoping Meeting
HNP-O	Tom Oxholm	Chief Financial Officer, Wake Stone Corporation	Afternoon Scoping Meeting
HNP-P	Carl Wilkins	Past President, North Carolina Chapter of the American Association of Blacks in Energy	Afternoon Scoping Meeting
HNP-Q	Nelle Hotchkiss	Senior Vice President of Corporate Relations, North Carolina Electric Membership Corporation	Afternoon Scoping Meeting
HNP-R	Ken Atkins	Executive Director, Wake County Economic Development	Afternoon Scoping Meeting
HNP-S	Hilda Pinnix-Ragland	Vice President, Progress Energy's Northern Region	Afternoon Scoping Meeting
HNP-T	Dick Sears	Mayor, Holly Springs	Evening Scoping Meeting
HNP-U	Gina Dean	State Advisor, NAACP	Evening Scoping Meeting

Commenters ID	Commenter	Affiliation (If Stated)	Comment Source and ADAMS Accession Number[(a)]
HNP-V	Ann Turnbill	Local Citizen	Evening Scoping Meeting
HNP-W	Lee Craig	Professor of Economics, North Carolina State University	Evening Scoping Meeting
HNP-X	Lou Ebert	President, North Carolina State Chamber of Commerce	Evening Scoping Meeting
HNP-Y	John Rukavina	Director of Public Safety, Wake County	Evening Scoping Meeting
HNP-Z	Marvin Furman	Local Citizen	Evening Scoping Meeting
HNP-AA	Sandy Jordan	Vice President of Economic Development, Cary Chamber of Commerce	Evening Scoping Meeting
HNP-BB	Bernie Hodges	President, Wade Manufacturing Company	Evening Scoping Meeting
HNP-CC	Elizabeth Rooks	Executive Vice President, Research Triangle Foundation	Evening Scoping Meeting
HNP-DD	William D. Lynch	People's Channel	Evening Scoping Meeting
HNP-EE	Ed Bonner	Member, Board of Directors of the Raleigh Chamber of Commerce	Evening Scoping Meeting
HNP-FF	Scott Lasell	Chairman, Eastern Carolina Section of the American Nuclear Society	Evening Scoping Meeting
HNP-GG	Tony Gurley	Chairman, Wake County Board of Commissioners	Evening Scoping Meeting
HNP-HH	Donna Alexander	Employee, Progress Energy	Evening Scoping Meeting
HNP-II	Herman Jaffe	Local Citizen	Evening Scoping Meeting
HNP-JJ	Jackie Clements	Retired Employee, Progress Energy	Evening Scoping Meeting
HNP-KK		Town of Clayton	Resolution (ML071300371)

Commenters ID	Commenter	Affiliation (If Stated)	Comment Source and ADAMS Accession Number[a]
HNP-LL		Holly Springs Chamber of Commerce	Resolution (ML071300371)
HNP-MM		Cary Chamber of Commerce	Resolution (ML071300371)
HNP-NN		Fuquay-Varina Chamber of Commerce	Resolution (ML071300371)
HNP-OO		Wake County Mayor's Association	Resolution (ML071300371)
HNP-PP		Greater Raleigh Chamber of Commerce	Resolution (ML071300371)
HNP-QQ		Wake County Economic Development Commission	Resolution (ML071300371)
HNP-RR		Board of Commissioners of the North Carolina Eastern Municipal Power Agency	Resolution (ML071300371)
HNP-SS		Raleigh-Apex NAACP	Resolution (ML071300024)
HNP-TT		Wendell-Wake Br. NAACP	Resolution (ML071300024)
HNP-UU		American Association of Blacks in Energy North Carolina Chapter	Resolution (ML071300024)
HNP-VV	Keith Sutton	President and CEO, Triangle Urban League	Letter (ML071300024)
HNP-WW	Liz Cullington	Local Citizen	Letter (ML071150313)
HNP-XX	Rudolph Williams	Local Citizen	Letter (ML071210160)

(a) The afternoon and evening transcripts can be found under accession numbers ML071300371 and ML071300377, respectively.

Comments Received During Scoping

A.1.1 Request for Information

Comment: I'm asking the NRC to provide a copy of the generic environmental impact statement to the Cary library. I also request that the NRC allow another 60 days to allow for adequate comment. (HNP-K-15)

Comment: The NRC is urged to allow another 60 days to allow for adequate comment. We also request that the GEIS be provided to the Cary Library and Eva Perry Library. Without these documents it is impossible for interested members of the public to know what environmental impacts are supposed to be considered in which process, the adequacy of current scoping plans, or how the process affects the future of their environment. (HNP-WW-7)

Response: *The NRC staff believes that 60 days is an appropriate time frame to conduct the environmental scoping process for License Renewal. A scoping period extension of 60 additional days in this case was not warranted. In the past the NRC staff has accepted late comments on the scope of the environmental review to the extent that it was practicable to do so. In response to this comment received during the scoping meeting, the NRC staff placed a copy of the GEIS in the local libraries and also provided a copy of the GEIS to the commenter.*

A.1.2 Opposition to Nuclear Power

Comment: I like to put the onus, the responsibility on the public, on us, to figure an issue. I worked for ABC News for many years. That doesn't mean a thing. I have the benefit of their library, and when Three Mile Island happened, and when the arms build-up in the '80s happened, I got involved in the anti-nuclear movement, and the anti-weapons movement.

But I realized, when somebody said to me, on the street, handing out a leaflet, you don't know what you are talking about. All the literature out there is a lot to read, isn't it? But to study the beast, or the benefit, is something we must do, right? That is why we are here. It is really serious. People joke. Like I was talking with one of the engineers from the NRC about the Simpsons being something that jokes about glowing reactors, and all this.

This is true. Why is this? Because are we scared of our ignorance of the issue, are we scared of the potential? When I drive across 64, and I see the cooling tower steaming away, and think of all the people boating, and having fun in the lake, and just the risk that exists, that is a gut fear. Apex had the chemical fire, Three Mile Island had their thing, Love Canal had their thing, Virginia Tech had their thing. The unexpected can happen. And that is why I'm actually more in the side of the military running plants than commercial ventures, because of the risk of profit overriding safety. (HNP-DD-2)

Response: *The comment is noted. The comment opposes nuclear power and does not provide any new information. This comment is not within the scope of 10 CFR Part 51 for the environmental review associated with the application for license renewal at Shearon Harris Nuclear Power Plant, Unit 1. Therefore, this comment will not be considered further in this SEIS.*

A.1.3 Support for Nuclear Power

Comment: And I agree with DOE assistant secretary Dennis Bergen, who recently said, any serious efforts to stabilize greenhouse gases in the atmosphere, while providing the increasing amount of energy for economic development and growth must include expanded use of nuclear energy. That, obviously, includes the retention of current capabilities through the license renewal process. (HNP-M-2)

Comment: In a broader context, nuclear energy is essential to a balanced portfolio for any energy company operating in North Carolina. North Carolina Electric Membership Corporation has interest in a nuclear plant as well, and supports the continuation and development of nuclear resources in our state. (HNP-Q-2)

Comment: I entered my profession because I believe that nuclear technology provides many benefits to our society, and improves our quality of life. I also believe, from many years of interactions with nuclear professionals, from Progress Energy and the NRC, that nuclear technology is being used safely for the generation of power here in North Carolina. (HNP-FF-1)

Comment: In my 12 years of experience, working at three different nuclear research reactor facilities, I have been continually impressed with the dedication and commitment of the nuclear professionals with whom I have come in contact. This includes the scientists and staff responsible for the operation and utilization of the facilities, and the NRC inspectors, and examiners, that regularly visit the facility, to assure the safe operation, and regulatory compliance. (HNP-FF-3)

Response: *The comments are noted. The comments are in favor of nuclear power and do not provide any new information. The comments are not within the scope of 10 CFR Part 51 for the environmental review associated with the application for license renewal at Shearon Harris Nuclear Power Plant, Unit 1. Therefore, these comments will not be considered further in this SEIS.*

A.1.4 License Renewal and Its Processes

Comment: The generic environmental impact statement is not adequate to address future environmental impacts 40 years into the future, since it was only prepared in the 1990s. Significant new mechanisms have been discovered since that time, which have drastically altered both projected impacts and timeliness of climate change effects.

Any issue that was covered inadequately in the GEIS, or not covered at all, but which involves future environmental impacts, in this case, should be allowed into the scope of the plant specific environmental impact statement. (HNP-K-14)

Response: *The NRC staff will base its analysis of environmental impacts of license renewal on the GEIS which was issued in 1996 as amended in 1999. As part of its review the NRC staff will look for any new and additional information that might call into question the conclusions reached in the GEIS for Category 1 issues. The review for Category 2 issues will take into account available site specific data and analysis to base its conclusions. While the commenter argues that the GEIS is outdated and should not be used as a base for the assessment, the NRC staff believes that the current process assures that any new information that comes to light will be used to make the final assessment of the environmental impacts of the proposed action.*

Comment: Scoping issues that ought to be included in the supplemental plant specific EIS, specific environmental and public health impacts that are supposed to be analyzed in the EIS seem very hard to predict in the future, but I tried to come up with a list of things that should be analyzed, and what is wrong with the current analysis. (HNP-K-4)

Comment: The vast majority of the public only had a few days notice from Sunday's April the 17th News and Observer, or possibly a week from one or more of the local papers. That is a certain amount of information, but probably not full or adequate. Without these documents it is impossible for interested members of the public to know what environmental impacts are supposed to be considered, and which process the adequacy of current scoping plans, or how the process affects the future of their environment. The entire relicensing process is a premature action which is unwise and unnecessary. What is the hurry? The Harris plant operating license is good for another 20 years, and does not need to be renewed at this time. To rule on aging and safety issues, 20 years in the future, is both risky and absurd. The licensee has not even attempted to frame these issues in the required future years of 2026 to 2046. Instead they have prepared a report that could be quickly adapted for other purposes, such as to support a combined operating and siting license, construction license, for one or two new reactors at the Harris site, since it covers conditions in the year 2006, not 2026, let alone 2046. (HNP-K-16)

Comment: Why are you all here? Are your heads tired, a lot of science, politics, economics? It may be because I'm a new resident to Chatham County, who is anti-nuclear, but is also curious about the whole issue, which isn't just are you against or for the plant, the renewal, another plant. Are you scared of the plant, are you wanting the plant? Or maybe because this opportunity to come to a meeting, to speak with the NRC, to speak with and listen to other community members who are very well versed in what their agenda is, to present to the public. What I have seen of the public's discussion of the issue is impassioned, desperate perhaps, fearful, and unfortunately not as informed as we could be. (HNP-DD-1)

Comment: But thank God the NRC is there, and that there are people who oversight, and that there is oversight, and there is review. But as we know, from Katrina, as we know from so many things, it is not enough. The responsibility is on us. As Progress Energy rate payers, as future rate payers if there is a new plant, as parents, citizens, Americans, taxpayers. (HNP-DD-3)

Response: *The comments are noted. These comments oppose license renewal and speak to NRC's license renewal review process in general, but do not provide new and significant information. The comments do not raise any issues within the scope of this license renewal review. Therefore, the comments will not be evaluated further.*

A.1.5 Opposition to License Renewal at HNP

Comment: It is their future, for our sins. And I'm just asking you to please consider it. People don't want alternative. I lived in Wales for a year and a half. Actually I thought the windmills looked pretty good. I would rather look at a windmill than look at nothing, or know that I lived and gave these sins of us, to our children. And that is about all I have to say, thank you. (HNP-B-2)

Comment: Shearon Harris has stalled on replacing known unsafe firewalls, and wiring, and does not really qualify as a responsible operator. The corrections must be made before you, the NRC, consider a license extension that Shearon Harris has asked for. (HNP-C-3)

Comment: For this reason alone it is dangerous and unnecessary for the NRC to proceed with considering extending the Harris plant license at this time. (HNP-K-7)

Comment: Because it is that important. The fire safety issues, the bizarre potential of an evacuation being jammed up, and any kind of a reaction to get away from an accident to me is crazy. But I have a lot more to learn about it. It is easy to say stuff. People talk a lot, there is not much real dialogue. American Idol is what people watch, isn't it? But do they watch the news, do they stay with an issue? I hope that everybody leaves here, tonight, with a different perspective. It is not about who is sitting here, or sitting there, or talking. It is what do we do at this point in our history about our energy use, and the safe development of it. Because this place is developing, North Carolina, the country, at an incredible rate. And is nuclear going to be one of the answers? (HNP-DD-4)

Comment: There are several other reasons, I said, that let's us want to consider not the extension at this time, but to wait ten years. We may be, by that time, considering shutting Shearon Harris down, and that is a fact of life. I know I heard about 11 people praising Progress Energy to the hilt, and I can appreciate why. But, you know, the world changes, things change, and it is time that you guys got out there and looked a little bit beyond your rose colored lenses. (HNP-II-2)

Comment: Progress Energy's Environmental Report is an arrogant insult to the public that pays their bills, drinks their radioactive water, and has to put up with their legitimate concerns being routinely dismissed as scaremongering, attacks on the workers, or sheer ignorance. It is clear that Progress Energy assumes that no one will read the report, a pretty fair assumption, but also that no one at the NRC will either. That is how low an opinion they have of the NRC. They apparently believe that they can submit any sort of document, as long as it is of suitable thickness, to support any new decision they are asking for. (HNP-WW-8)

Response: *The comments are noted. The comments oppose license renewal at Shearon Harris Nuclear Power Plant, Unit 1 and do not provide new and significant information. These comments are not within the scope of 10 CFR Part 51 for the environmental review associated with the license renewal application for HNP. Therefore, these comments will not be evaluated further in this SEIS.*

A.1.6 Support for License Renewal at HNP

Comment: I'm here to speak in favor of extending the license for the Shearon Harris nuclear power plant. (HNP-D-1)

Comment: I have toured the facility and, periodically, talked with some of the plant's staff and employees. They have earned my confidence, over the years, and I'm pleased to speak in support of this application to extend the license, for the Harris facility, for an additional 20 years. (HNP-D-7)

Comment: Many of the employees who work at the Shearon Harris plant live in, and are a part of, our community. I am confident that their commitment to safe operation of the plant, and their strong commitment to the environment, are there. There are numerous activities that the lake, and the Harris park, offers, to citizens, including hiking, and nature trails. (HNP-E-2)

Comment: While we face challenges in meeting the demands of growth, certainly our region has, and will continue, to meet those challenges while we work together. In that spirit of team work, cooperation, the Wake County Mayors Association has unanimously, there are 12 municipalities in Wake County, and they support this renewal, unanimously, with a resolution. I'm also a member of the Board of Directors of the Fuquay Chamber of Commerce, and its support was unanimous. I truly believe that we will have a continued safe and reliable operation at the Harris plant, with the 20 year license renewal. (HNP-E-4)

Comment: Progress Energy has an outstanding track record and is recognized, world-wide, as an industry leader in safe and reliable nuclear operations. The North Carolina Municipal Power Agency supports the continued safe and secure operations of the Harris plant, and encourages favorable considerations of the license renewal extension. I have left a copy, with your receptionist, of my remarks, plus the Resolution of the 32 cities in support of this license renewal favorably. I thank you for the opportunity to speak to you this afternoon. (HNP-F-2)

Comment: In closing, the town of Clayton, and the Eastern Municipal Power Agency, endorse the application of Progress Energy to renew the operating license for Shearon Harris nuclear generating plant. Premature closing of the plant would have a negative impact for the more than 425,000 citizens in the agency municipalities, and the more than 250,000 electric customers they serve. We encourage you to give favorable consideration to a safe and secure operating license renewal of the Shearon Harris plant for the economic and environmental reasons previously stated. (HNP-G-3)

Comment: The Cary Chamber fully supports the continued safe and secure operation of the Harris plant, and encourages the NRC to extend the Harris plant's operating license an additional 20 years. (HNP-H-1)

Comment: To the NRC we ask that you take whatever steps are necessary to facilitate the operating license extension, and thank you for allowing us to participate in this hearing today. And I would also like to leave, with you, a resolution that was unanimously approved by our Board of Directors and our Executive Board. (HNP-H-5)

Comment: On January 24th, 2007, with one hundred percent support, the Holly Springs Chamber of Commerce Board of Directors passed a resolution in support of the continued safe and secure operations of the Shearon Harris nuclear plant. Besides Progress Energy's proven track record and safety, we also recognize their tremendous economic impact, and the environmental resources that Progress Energy has in Holly Springs, as well as within Wake County. Please support the necessary steps to facilitate the operating license extension. (HNP-I-1)

Comment: Obviously it has a big impact. Greater Raleigh Chamber of Commerce would support this relicensing request, and would ask that the agency consider the fact that this growth has taken place in the market, and will have an impact on the need for electricity in our community for some time to come. (HNP-J-2)

Comment: And I have submitted a resolution in support of the Harris license renewal. I work with Progress Energy on various projects over the years. And I'm familiar with its Harris plant. (HNP-L-1)

Comment: Therefore I support to ensure the Harris plant continues to operate in the future, providing safe, reliable, and affordable energy. (HNP-L-3)

Comment: It is important to clarify that if our application is approved, that doesn't give us carte blanche to operate for another 20 years. We have to earn that license every minute, of every day, through our performance. We are a good neighbor, and a capable corporate citizen. And we intend to preserve what has been entrusted to us, and that is our commitment. (HNP-M-5)

Comment: Like other community leaders I have worked closely with Progress Energy since 2000, and I know first hand the commitment this company has to the community that it serves. As that community continues to grow, with these accolades and others, so will the demand for electricity. Therefore I advocate for safe, affordable, and reliable electricity. And in my observation Progress Energy is capable of providing such and, therefore, I support moving forward with the license renewal of the Harris plant. (HNP-N-1)

Comment: With demand for our products growing in Wake county, and eastern North Carolina, failure to renew the license of the Harris plant would threaten the reliability of our needed power source, and affordability of our products. (HNP-O-4)

Comment: Thank you for the opportunity to speak, and to ask you to please renew the Harris plant license. (HNP-O-7)

Comment: We have lived with the Shearon Harris nuclear power plant in our region since 1987 and have observed that it is operated without a major incident. We also know that it operates at a low cost of production, which helps keep our local electric rates low. In addition we have observed that it has operated reliably and safely. Therefore it is the opinion of the North Carolina Chapter of the American Association of Blacks in Energy, that Progress Energy's application to extend this operating license for Shearon Harris nuclear power plant be granted by the Nuclear Regulatory Commission. (HNP-P-3)

Comment: North Carolina Electric Membership Corporation is a wholesale customer of Progress Energy Carolinas. The Harris plant is an important part of Progress Energy's resources. Extending the life of a well run, existing plant, in today's global environment of rising energy costs, and environmental sensitivity, provides for the continuation of emission free, reliable power, at the lowest possible cost to the citizens of North Carolina, including our electric cooperative membership. (HNP-Q-1)

Comment: We strongly support the relicensing of the Harris plant and encourage the Nuclear Regulatory Commission to do so as well. (HNP-Q-3)

Comment: I'm here to support the extension of the license for Progress Energy. North Carolina and Research Triangle Region is recognized as one of the most dynamic economies in the U.S., we heard some of the earlier accolades. (HNP-R-1)

Comment: It is for that reasons, and many of the others that you heard today, that Wake County Economic Development strongly supports the extension of the license. We feel it is a critical part of our vibrant economy and must be in place for us to move forward. (HNP-R-3)

Comment: Now, as I close, I'm extremely pleased to announce that we have support from 13 different entities. These are resolutions. Some of them have been mentioned already. I will mention just the 13. The Raleigh Apex branch of the NAACP, the American Association of Blacks in Energy; the Wendell Wake branch of the NAACP, the Triangle Urban League, the Holly Springs Chamber of Commerce, the Fuquay-Varina Area Chamber of Commerce, Wake County Economic Development, Town of Clayton, the Greater Raleigh Chamber of Commerce, the North Carolina Economic Developers Association, the North Carolina Eastern Municipal Power Agency, and the Wake County Mayors Association.

Again, I thank you for allowing me this opportunity, and I definitely endorse the renewal of the plant. (HNP-S-4)

Comment: And I'm pleased to support, pleased to support, Progress Energy's request for license renewal. Briefly, which is difficult for mayors, the reasons behind that would include I met with both of these gentlemen, several months ago, and we talked about this in detail. The plant has been part of our area, now, for almost 20 years. And, in my opinion, they have supplied safe, reliable, efficient, and clean electricity to our town, region, and state. (HNP-T-1)

Comment: We have just been impressed with the diversity initiatives that Progress Energy has shown us, as well as their relationships with the community. And so it is with great pleasure that I lend our support, and the NAACP, and to the Harris plant, but in short, we have the confidence that will tend to the growth, and everything else, as they always have, and will continue to do. (HNP-U-1)

Comment: And we are just very fortunate that we live in Wake County, in experiencing the growth, and the prosperity here. And having said that, I would like to tell you that I hope that you grant the renewal for the license for the Shearon Harris nuclear plant so we can continue to grow and prosper in Wake County. (HNP-V-2)

Comment: I'm pleased to stand here tonight in support of Progress Energy's application for reauthorizing the Shearon Harris plant. The State Chamber, the North Carolina Chamber, and its 25,000 members across the state, support a growing and competitive economy, which creates opportunities for all North Carolina citizens. (HNP-X-1)

Comment: We expect that that relationship will continue, and we look forward to working with Progress Energy in maintaining those emergency response plans, and exercising them so that if something were to occur we would be ready to respond appropriately in the interest of the community. (HNP-Y-1)

Comment: For 20 years the Shearon Harris nuclear plant has helped provide the region with reliable electrical energy. It is a facility that has operated safely, and efficiently, during those 20 years, and is extremely important, as our region looks to its future prosperity. Accordingly I would ask the Commission to positively act on the license renewal request requested by Progress Energy. (HNP-AA-2)

Comment: I am not aware of any environmental or safety issues caused by the Shearon Harris plant. I believe the past record, and rules and regulations that the plant operates under, are evidence of a well run and properly regulated facility. I simply believe the word nuclear has bad connotations. I wish we could change the word. I certainly believe the majority of homeowners and industrial customers want the lowest rate for electricity. I further believe that all North Carolinians want to do our best to save manufacturing jobs in our state.

For these reasons I support and strongly encourage the office of Nuclear Reactor Regulation, to fully investigate and extend the requested operating license for the Shearon Harris plant. (HNP-BB-3)

Comment: The Research Triangle Foundation is the developer of the Research Triangle Park, a 7,000 acre science park, which houses 157 companies, and over 20 million square feet of buildings, and employs more than 39,000 people. RTF has been a major economic engine for the Triangle area, and for North Carolina as a whole. Provision of adequate, clean, cost-effective, reliable electricity is crucial to the maintenance, and future expansion, of companies in RTP. For these reasons we support the license renewal of the Harris plant. (HNP-CC-1)

Comment: And I would like to respectfully submit, for the record, a resolution passed unanimously, by the general membership of the Raleigh Chamber, supporting the extension of Progress Energy's license to operate the Shearon Harris nuclear plant. (HNP-EE-1)

Comment: And, finally, Progress Energy's commitment to our community. The membership of our chamber recognizes that extending the operating license of the Harris plant is an important part of meeting our community's growing electricity needs, and asks this Commission to extend the license of the Shearon Harris nuclear plant. (HNP-EE-4)

Comment: I would, therefore, like to go on record as supporting the relicensing of the Shearon Harris plant, by the NRC, because I believe that nuclear energy is a reliable and environmentally sound, and above all else, a safe form of power generation. (HNP-FF-2)

Comment: So, to summarize, my professional experience has given me an appreciation of the clear benefits of nuclear technology. And, as importantly, trust and respect for the people that are responsible for ensuring its safe deployment and utilization here in North Carolina. In closing I simply ask the NRC to carefully and thoughtfully execute your responsibilities as related to the renewal of the Harris plant license, and support the ongoing generation of electricity with nuclear power. (HNP-FF-5)

Comment: I would like to express my personal support for the license renewal for Progress Energy's Shearon Harris facility. My responsibility as a county commissioner is to prepare for the growth in our county, while improving the quality of life for all citizens. I have found Progress Energy to be a willing and capable partner in my efforts, over the past five years. Progress Energy, through its capable employees, have contributed in a very positive manner, as a responsible corporate citizen. Most importantly the services and the energy produced by Progress Energy are needed and are essential to the continued growth of this area. I'm proud to offer my support and gladly offer my thanks for the many contributions from Progress Energy to the citizens of Wake County. (HNP-GG-1)

Comment: I am -- I can personally attest to the company's commitment to the environmental protection, both from a radiological and non-radiological programs. I am proud to work with a dedicated team of individuals at the plant. Many long time employees that provide the essential energy for the area. And I can say that decisions made at the plant safety is considered first and foremost in all decisions that are made, both personal safety and nuclear safety. And I'm excited to be a part of the extended operating license for the Harris plant. (HNP-HH-1)

Comment: And I'm here to personally attest to my complete confidence and trust in the ability of Progress Energy to continue to operate the Shearon Harris plant, which we need, in the most safe, reliable, efficient operation. I have worked with the management teams, and employees of the Shearon Harris plant, during the construction of the plant, as well as after it went into commercial operation. (HNP-JJ-1)

Comment: I appreciate the opportunity to speak tonight, to you. And, again, I'm in favor the license renewal. We need the plant to meet customer growth. It is clean power. The management team at Progress Energy, as well as the employees, have a culture of acting with integrity, and the commitment to nuclear power is there on a daily basis, 24/7. (HNP-JJ-3)

Comment: NOW, THEREFORE, BE IT RESOLVED that the Town of Clayton supports the continued safe and secure operation of the Harris Plant and encourages the Nuclear Regulatory Commission to extend the Harris Nuclear Plant's operating license an additional 20 years. (HNP-KK-5)

Comment: Now, Therefore, Be It Resolved that the Holly Springs Chamber of Commerce supports the continued safe and secure operation of the Harris Plant and encourages the Nuclear Regulatory Commission to extend the Harris Nuclear Plant's operating license an additional 20 years. (HNP-LL-5)

Comment: Now, Therefore, Be It Resolved that the Cary Chamber of Commerce supports the continued safe and secure operation of the Harris Plant and encourages the Nuclear Regulatory Commission to extend the Harris Nuclear Plant's operating license an additional 20 years. (HNP-MM-5)

Comment: Now, Therefore, Be It Resolved that the Fuquay-Varina Area Chamber of Commerce supports the continued safe and secure operation of the Harris Plant and encourages the Nuclear Regulatory Commission to extend the Harris Nuclear Plant's operating license an additional 20 years. (HNP-NN-5)

Comment: Now, Therefore, Be It Resolved that the Wake County Mayor's Association supports the continued safe and secure operation of the Harris Plant and encourages the Nuclear Regulatory Commission to extend the Harris Nuclear Plant's operating license an additional 20 years. (HNP-OO-5)

Comment: Now, Therefore, Be It Resolved that the Greater Raleigh Chamber of Commerce supports the continued safe and secure operation of the Harris Plant and encourages the Nuclear Regulatory Commission to extend the Harris Nuclear Plant's operating license an additional 20 years. (HNP-PP-7)

Comment: Now, Therefore, Be It Resolved that the Wake County Economic Development Commission supports the continued safe and secure operation of the Harris Plant and encourages the Nuclear Regulatory Commission to extend the Harris Nuclear Plant's operating license an additional 20 years. (HNP-QQ-7)

Comment: Now, therefore, be it resolved that the Board of Commissioners of the North Carolina Eastern Municipal Power Agency supports the continued safe and secure operation of the Harris Plant and encourages the Nuclear Regulatory Commission to extend the Harris Plant's operating license an additional 20 years. (HNP-RR-6)

Comment: Now, Therefore, Be It Resolved that the Raleigh-Apex NAACP supports the continued safe and secure operation of the Harris Plant and encourages the Nuclear Regulatory Commission to extend the Harris Nuclear Plant's operating license an additional 20 years. (HNP-SS-5)

Comment: Now, Therefore, Be It Resolved that the Wendell-Wake Br. NAACP supports the continued safe and secure operation of the Harris Plant and encourages the Nuclear Regulatory Commission to extend the Harris Nuclear Plant's operating license an additional 20 years. (HNP-TT-5)

Comment: Now, Therefore, Be It Resolved that the American Association of Blacks in Energy North Carolina Chapter supports the continued safe and secure operation of the Harris Plant and encourages the Nuclear Regulatory Commission to extend the Harris Nuclear Plant's operating license an additional 20 years. (HNP-UU-5)

Comment: We support the continued safe and secure operation of the Harris Nuclear Plant and encourage the Nuclear Regulatory Commission to extend the plant's operating license an additional 20 years. (HNP-VV-3)

Response: *The comments are noted. The comments support license renewal at Shearon Harris Nuclear Power Plant, Unit 1 and do not provide new and significant information. These comments are not within the scope of 10 CFR Part 51 for the environmental review associated with the license renewal application for HNP. Therefore, these comments will not be evaluated further in this SEIS.*

A.1.7 Water Quality and Use Issues

Comment: I urge the NRC to reject Progress Energy's application for license extension at this time. If the NRC insists on proceeding along this relicensing track, then I urge the NRC to reject the company's draft EIS and require them to attempt to meet their legal requirements for the future period in question. Secondly, the NRC must not begin consideration of an application for one or two new reactors at the Harris site, until the relicensing process for the first reactor is finalized, and all the water supply, and other issues, described above, are resolved. The NRC must not allow a separate track process under which the company could allocate the same resource to several different safety and environmental impact analysis without the left hand counting what the right hand is doing. (HNP-K-17)

Comment: The first one is water supply for reactor cooling. There are significant water supply issues with the plant now, with water having to be pumped from the lower Harris lake reservoir, to the upper lake reservoir, during dry months. The source for this information is Progress Energy's application for renewal of its North Carolina NPDES permit in 2006. Harris lake, compared to some other lakes in our state, has a relatively small and poor cachement area. It is not fed by a single major river. To what extent is Progress Energy double dipping in regards to the possibility of raising the water level in the lower reservoir of Harris Lake? The company has said that this could be done to serve two additional reactors. That water supply, if that is done, that water supply would not be available for additional reactors if it turns out that it is needed for the current reactor, and vice versa. (HNP-K-5)

Comment: In addition to actual water volume use of the lake for makeup water for a nuclear reactor, raises its temperature. And so a usable water body can be temperature limited, and affected by increasingly hot summers. The availability of Harris lake as a heat sink not just for routine cooling for the period of 2026 to 2046 would need to be evaluated in light of this water supply factors, and may need to be evaluated for the current term of the operating license. (HNP-K-6)

Response: *The comments are noted. Water use conflicts and Cumulative Impacts are discussed in Chapter 4 of this SEIS.*

Comment: The high level waste storage, i.e., the fuel pools and the water supply, a separate analysis would need to be done for future scenarios of climate change on the fuel pools, including the possibility of no repository. This analysis must include the availability of the lake to provide cooling, and the heat sink, to the fuel pools, and the reactor, simultaneously, under the most severe drought conditions, and the most catastrophic accident conditions. (HNP-K-8)

Comment: Issue number 4, water impacts and water pathways to humans and other species. An environmental impact statement for an additional 20 years of operation beyond 2026, would have to be able to adequately predict, under uncertain climate change scenarios, all the water pollution aspects of all those activities just discussed above. (HNP-K-10)

Response: *While climate change is a legitimate concern, the specific impacts of climate change within a particular region or watershed are still highly speculative, and are, therefore, beyond the scope of a NEPA review for reactor license renewal. Furthermore, any changes in watershed characteristics would likely be gradual, allowing water-use conflicts to be resolved as needed. The comment does not provide new and significant information; therefore, it will not be evaluated further.*

A.1.8 Human Health Issues

Comment: Tritium is currently released at the Harris lake, and thus into the Cape Fear river downstream, which is used as a drinking water source by a number of counties and municipalities. Harnett county is merely the first intake downstream. And water from that intake is currently sold to other water needy counties and municipalities. Tritium cannot be filtered out of water, and is incorporated into the body of humans and other animals. Analysis would have to include increased emissions of tritium, under aging and accident scenarios, and include higher concentration under drought conditions, and the concentration and consequent exposures during simultaneous catastrophic accident and severe drought conditions. (HNP-K-11)

Comment: Anyway, I want to talk about the safety issue. And I'm not talking about nuclear meltdowns, and we can forget about the adverse environmental factors, and we also can forget about the terrorist factor here. What I'm talking about is that if you have parents who live in this area, and you have children, your children are in danger of getting leukemia. There is a better chance they will get leukemia because there is a nuclear power plant here. And I have pulled evidence off the internet to show this here, and I will just point out that there is so much evidence on this here, and I'm only going to point out two things to you. First I'm going to tell you that Canada, France, Germany, and the Soviet Union, there were high incidence of leukemia in the proximity of nuclear power plant among children. And another example of evidence that I'm going to give you, is that SEER, that is surveillance and epidemiology and end result program, of the United States Center for Disease Control and Prevention, came out with figures that from 1975, to 2000, cancer rates in children, near nuclear power plants, went up 40 percent. If you are a parent, but more important Mayor are you here? Do you have grandchildren? Are you concerned about your grandchildren? Okay, think about that, look it up. Those children are in danger, I'm telling you. Wake up. (HNP-Z-1)

Comment: All exposure analyses to humans would have to be able to predict demographic patterns 20-40 years into the future (currently predicted to be increasing sharply.) (HNP-WW-2)

Comment: (v) Additional operational exposures: An EIS would have to predict accurately the range of the additional future radiation exposures through all pathways from an additional 20 years of plant operation forty years into the future to:

(A) nuclear plant workers including contract workers

(B) the public near the nuclear plant

(C) uranium miners

(D) the public near or downstream of uranium mining

(E) fuel fabrication workers

(F) the public near fuel fabrication facilities

(G) spent fuel handling workers

(H) the public along spent fuel transportation routes

(I) low-level waste transport workers

(J) the public along low-level transport routes

(K) low-level waste incineration and compaction workers

(L) the public near low-level waste incineration and compaction facilities

(M) low-level waste disposal workers

(N) the public near low-level waste disposal facilities

(HNP-WW-3)

Comment: (vi) Air, ingestion, direct and other pathways: An EIS for an additional 20 years of operation during the period 2026-2046 would also have to consider all other exposure pathways to humans. All pathways of radioactive emissions/releases/pollution through food animals and fish to humans would have to be analyzed. Progress Energy's annual or periodic environmental reports state that there are no food animals impacted by the Harris Plant, but in fact there are deer and ducks that can migrate from Harris Lake to adjacent game land and Jordan Lake and which are seasonally hunted for food. Harris Lake is open to fishing and fish caught in the lake are consumed as food. The EIS should also consider future conditions under various fuel constraint and economic downturn scenarios under which there is an increase in the utilization of these food sources. (HNP-WW-4)

Response: *The comments are noted. The GEIS evaluated radiation exposures to the public for all plants including HNP, and concluded that the impact was small. During the plant-specific environmental review, the NRC will search for new and significant information that causes the NRC to question this generic conclusion for HNP. The information provided by the comments will be reviewed as part of that search. In addition, evaluation of new studies and analyses of the health effects of radiation exposure, such as BEIR VII, is an ongoing effort at the NRC. If significant new information is found, the NRC will perform a plant-specific analysis of this environmental impact. This issue is addressed in Chapter 4.*

A.1.9 Socioeconomic Issues

Comment: Shearon Harris is also a member of the local community. Its management communicates with, and advises, local and state officials, on matters related to its operation. It communicates with the public through its visitor centers, and outreach programs, and participates with local and state organizations, in safety related drills and exercises. (HNP-D-6)

Comment: Aside from benefiting from the plant's safe and productive operation, our community realizes a tremendous positive and economic impact from Progress Energy and the Harris plant by virtue of the tax revenues generated, salaries generated, and the company's strong philanthropic contributions to Cary and Wake County. (HNP-H-4)

Comment: We are a 37 year customer of Progress Energy, spending close to a million dollars per year for power to crush our products to state specifications. We count on them to always provide our stone crushing plants with a reliable power. A power outage in our business means equipment that locks up, full of thousands of tons of raw material. A lockup might take us a full day to unclog. When we do have a power problem they get right on it, helping us get back in business as quickly as possible. The Harris plant is an important part of Progress Energy plan to ensure reliable power at the lowest possible cost to us, and to other business customers. (HNP-O-1)

Comment: I would also like to add that I'm a former member of the Wake county Board of Education, serving from 1999 to 2003. And there is no better partner for public education than Progress Energy. School children's safety is always their top priority. And Wake County public schools confidently depend on their reliability record. (HNP-O-5)

Comment: I will leave the complete list with you, but I think you are getting a feel for what we are saying. These new companies, and the others that came in, represent 29,759 net new jobs for the citizens of Wake County. We must continue to grow our jobs, and investment, for us to continue having a dynamic economy. My staff and I were involved in every one of the projects I just mentioned. And I can tell you a key factor in their decision to come here was the availability of reasonably priced reliable energy. And it is extremely important to us that this license be renewed, because many of these companies, particularly Novardas [Novartis], the vaccine producer, it will take them five to six years even to get their facility up and operating. They are very concerned that there is a long term plan in place to continue having a good steady supply of electricity, and a very vibrant market. (HNP-R-2)

Comment: Now, we are also mindful of making an impact in our communities. In fact, there are two great examples. Our employees, and our customers, since 1982, have contributed more than 16 million dollars to our energy neighbor fund. Now, that fund was created by us to make sure those customers who can't afford to pay their bills, have that opportunity. And they can do so by applying for this Energy Neighbor Fund dollars. Furthermore, in 2006, Progress Energy contributed more than 12 million dollars to support our community, to enhance education, to protect the environment, to promote economic development. And, of course, we are supportive of our communities, because we have more than 10,000 employees, out and about in our communities. Now, we have a major tax impact on this community. I think someone mentioned it earlier. In Wake County the tax revenue is about 15.1 million dollars, of which 7.4 million is directly attributable to the Harris plant. (HNP-S-3)

Comment: We also need roads, which is another subject that we will talk about at a different time, for the traffic that all these people bring to our area. (HNP-T-4)

Comment: Whether we realize it or not, Progress Energy touches all of our lives. Not just when we flip on the light switch, or drive down the street at night, but they are a member of our community, and an excellent corporate citizen. If you are not aware, Progress Energy supports this community in many, many ways. And I know this because I do some volunteer work with my PTA, through my son's school, and through other educational programs and organizations.

They are a generous supporter of public education, and they demonstrate a true, true commitment to the high quality that we experience here in Wake County. (HNP-V-1)

Comment: As I just mentioned, my report tonight summarizes an economic impact study. There are two ways in which one can interpret an economic impact study of this type. One way is to interpret it in a way that would let us view and answer the following question. Holding all other economic variables constant, what does the plant in question contribute to the local economy? Another way to interpret a study like this would be to see it as an answer to a slightly different, but related, question. Which is, if this plant had never been constructed, or if it were to be closed, or otherwise go missing, then how would that impact the local economy? (HNP-W-1)

Comment: The economic impact report that I'm summarizing contains at least five key economic indicators. These are: One, the value of economic output; two, employment; three, personal income, which is to say primarily wages and salaries; four, all other income; and five, tax revenues. As of calendar year 2005 Dr. Erickson estimates that the Shearon Harris plant generates the following economic impacts for these five categories. The plant generates roughly 700 million dollars in economic output. The plant supports more than 2,100 jobs in the Triangle region. The plant generates 86 million dollars in personal income, and nearly 40 million dollars in other income. And the report estimates that the plant generates roughly ten million dollars in indirect business taxes, which in North Carolina are largely sale taxes, and 20 million dollars in property taxes. In concluding this summary I offer one additional and final impact, which was estimated in the report. At current property tax rates, in the Triangle Region, the property value required to generate 20 million dollars in property taxes is approximately 2.8 billion dollars, which is greater than one percent of the value of the assessed property in the Triangle, at the time of the study. (HNP-W-2)

Comment: WHEREAS, the Harris Plant provides approximately $10 million dollars in taxes to Wake County each year; (HNP-PP-6 through RR-5)

Comment: The Harris Plant has been a part of the local community for two decades and has proved to be an outstanding corporate citizen, providing significant economic benefits to the surrounding community. Since 1987, the plant has been generating safe and efficient electricity to more than 550,000 homes and businesses. More than 600 people work at the Harris Plant and live in the surrounding communities in Wake, Chatham, Harnett and Lee counties. (HNP-VV-1)

Response: *The comments are noted. Socioeconomic issues are Category 2 issues which are addressed in Chapter 2 and 4 of this SEIS.*

A.1.10 Uranium Fuel Cycle and Waste Management Issues

Comment: Let me start by saying that I'm not here saying I know everything, I know nothing. I'm just a mom, I'm a grandmother, I'm a wife. I'm very concerned about what we are going to do with the spent rods, before we do any renewal of license. I have been here for two years.

Previous to that I lived in a small town called Bayville, New Jersey. We were right outside Oyster Creek. You guys renewed their license, I cried that day. If you could renew Oyster Creek license, you could renew your license. But anyone that opposes it, I feel for you, I truly do feel for you. And what I'm doing is I'm begging that you do look into disposing of these used rods. When we first started nuclear energy we never expected to keep them on the facilities, and we have. They don't want them out there in the desert, in Nevada. They are very, very dangerous in our backyards. (HNP-B-1)

Comment: The Progress Energy staff has demonstrated, over the past 20 plus years, that it is fully capable of safely operating the facility, and storing the spent assemblies in pools, and in dry casks. I am convinced that they are fully capable of also preparing the assemblies for shipment, when the repository, or an interim storage facility is available. (HNP-D-2)

Comment: The global nuclear power industry has now, according to my estimates, over 12,000 reactor years of operation, or operational experience. The storage pools at Shearon Harris was originally built to store the assemblies, from the four reactors for which the site was originally designed. There is, of course, only one reactor in operation at the site, and the pool holds, of its own fuel, again according to my estimates, less than 25 percent of its capacity of 8,400 rods, or assemblies. And with its own fuel will only be approximately at 75 percent of capacity, at the end of the relicense period. (HNP-D-3)

Comment: Uranium supply, analysis of remaining global uranium supply does not support the feasibility of operating the Harris plant for an additional 20 years under current assumptions regarding fuel availability, or price. Uranium prices are projected, by industry analysts, to continue to rise with global scarcity, and increasing global demand for uranium, for both fuel fabrication and nuclear feed stock, until they reach 500 dollars a pound, and then conceivably people would just stop paying. The price advantage cited by Progress Energy and the nuclear industry, generally, over other alternatives, often relies on old uranium prices, such as when several years it was 8 dollars a pound, now it is 113 dollars a pound, and shows no sign of slowing down. It has risen 57 percent since the start of 2007. Uranium mining is dependent on a supply of water very nearby. The environmental impact statement would have to consider the effects of uranium mining using alternative water supply methods because, basically, that water supply future is not assured. (HNP-K-13)

Comment: The EIS would have to project the environmental effects of alternative methods of uranium mining, in the 2026-2046 period, and its effects on price of uranium mining/operational cost factors of HNP compared to alternative sources under futuristic pricing scenarios. (HNP-WW-6)

Response: *The comments are noted. All of the environmental impacts associated with the uranium fuel cycle are addressed in the GEIS. The GEIS concluded that all of those impacts including the offsite radiological impact of storage, transportation, and disposal of spent fuel and other radioactive waste are Category 1 issues. The impact of all these Category 1 issues was judged to be small in the GEIS. During the plant-specific environmental review of HNP, the NRC will search for new and significant information that causes the NRC to question the generic* *conclusion for HNP. If significant new information is found, the NRC will perform a plant-specific analysis of these environmental impacts. These issues are addressed in Chapter 6.0 of this SEIS.*

A.1.11 Comments Concerning Alternatives

Comment: An environmental scoping process is not a popularity contest. The environmental impact statement is supposed to analyze the effect of a no-action alternative, which would mean an NRC denial to extend the operating license beyond 2026 to 2046, or deciding not to do so at this time. It also has to consider alternative sources for power. We are talking about a very early extension of the license. The license doesn't expire for 20 years. We won't have the same staff, we won't have the same environmental conditions, we won't have the same population. (HNP-K-1)

Response: *Chapter 8 of the HNP SEIS will contain the analysis related to alternatives to the proposed action. The National Environmental Policy Act (NEPA) requires the consideration of alternatives to the proposed action in an environmental impact statement (EIS). NEPA also requires the alternatives analysis in the EIS to include the alternative of no action. In the case of license renewal not renewing the operating license.*

Comment: Seeking other sources, without the Shearon Harris plant, would undoubtedly direct the agency to other higher costs, fossil fuel generating plants, in the southeastern, part of the United States. That is, of course, assuming there is transmission capacity in order to get that power to our member cities. In addition to economic impact, consideration should be given to the negative impact of replacing clean nuclear power with fossil fuel power, that generates greenhouse gases, carbon monoxide, sulfur dioxide, mercury, and nitrogen oxide. Likewise, conservation measures would not be sufficient to offset the loss output from the Harris plant. (HNP-G-2)

Comment: The alternative energy sources that Progress Energy has considered, in its report, are limited to those that are available now, in terms of electricity demand now, not in 2026. And on their claim that energy demand is simply going to increase for the foreseeable future. They only consider, in their report, power generation sources that they consider viable now, a new nuclear or new fossil fuel plant, or purchase power from such dirty sources, rather than what might be available, and viable, in 2026. (HNP-K-2)

Comment: Alternatives, any discussion of available alternative energy generation must be done for a period beginning 20 years into the future, and not based on currently available technologies or prices. Reasonable assumptions, which are not found in Progress Energy's report, include wind, solar, and current clean renewable alternatives will be cheaper than at present, and possibly have lower impacts than at present. Additional renewable energy options will be developed in the future, beyond what is considered in Progress Energy's report, or basically in any of our minds right now. Thirdly, coal fired power plants may not be an available or viable option in 2026, and natural gas supplies via pipeline may not be available either. If the environmental impact statement is still to include alternatives such as new nuclear, coal or natural gas generation, then their environmental impacts would have to be evaluated, thoroughly, for the period 2026 to 2046, for their entire fuel cycle, not just utility operation. From exploration and mining, through transportation, and up to disposal of wastes, it would also have to include all the resources committed and used, those would be impacted in the full range of water and air emissions, resulting in deep stage. (HNP-K-12)

Comment: The newspaper article stated that Shearon Harris supplies 12 percent of Progress Energy's capacity now. That is a small amount when I look at the study done for the North Carolina State Utility Commission, as directed by the State. The study states that we can get ten percent of our electric needs from solar and wind if we develop them. The associate, Mr. Jonathan Winter, also agreed with me that the new environmentally sound compact fluorescent light bulbs, now on the market, will reduce demand by at least 25 percent over the next few years. Progress, two years ago, reported capacity on hand to us through 2016, with no increase in capacity needed. Now you take these numbers, and they tell us that we really don't need Shearon Harris, or any other nuclear or coal plants at this time. By 2016 California's public gas and electric, which is one of the largest, if not the largest in the United States, is instituting a program, right now, to boost electric car power for the grid, on demand, and will be in operation within the next four or five years. They are planning on using something like the new Honda electric car that is due for sale to the public in 2009. You can read about this in this article here, in the newspaper, but you folks don't get this kind of newspaper, it is a weekly that goes out world-wide, it is called the Epic Times. That is why this is not the time to consider a license extension, as I said earlier. Progress should be spending time studying places like Wakeland, Florida's utility plant, where they have leasing solar hot water heaters to their rate payers. (HNP-II-1)

Comment: Progress Energy's Environmental Report (Draft EIS). The Environmental Impact Statement is supposed to analyze the effect of the "no action alternative" which means the NRC denying to extend the operating license for the period of 2026 to 2046, or deciding not to do so at this time. Progress energy has not provided any evidence or compelling argument that the operating license needs to be renewed, or more accurately, extended, now, 20 years in advance of when that action might be needed.

Progress Energy has rounded up a number of resolutions in favor of license extension from local chambers of commerce, and their glossy brochure might lead you to think that this action is needed now to allow the plant to operate for the next twenty years. However, the company makes it clear in their 476 page "Environmental Report" that, in the unlikely event of the NRC not renewing the operating license, the plant could still operate until 2026.

In addition that brochure uses an old technique illustrated in that old but still relevant book "How to Lie with Statistics" in comparing nuclear energy to other sources. Leaving aside for the moment the misleading nature of only considering the fuel component, the figure used to illustrate these costs adds in two misleading features. One is the reference to a processed uranium pellet rather than the many pounds of raw uranium ore, but the other is that as the height of the little picture grows, so does the width. So you might take away the idea that other sources of large centralized power are seven times as costly, rather than merely slightly higher, were these figures actually total costs, which they are not.

Worse, Progress Energy claims in the material that they are not handing out, but burying within hundreds of pages in the Apex Library, that since the impacts of decommissioning the plant in 2026 would be the same as decommissioning it in 2046 there is no difference, conveniently leaving out the significant and varied additional public health and environmental impacts of 20 years of additional uranium mining, plant releases, and 20 years more worth of high and low-level radioactive waste.

The alternative energy sources that Progress considers are limited to those that "meet system needs" based on electricity demand now, not in 2026-2046, saying that energy demand is going to increase "for the forseeable (sic) future." They only consider power generation sources that they consider viable now, a new nuclear or fossil fuel plant, or purchased power from such sources, rather than what might be available and viable in 2026.

Progress Energy describes "incentive programs that encourage customers to replace old, inefficient appliances or equipment with new high-efficiency appliances or equipment" as if it were a current program, but there is no such program in the company's NC service area, and there has never been one. If there's one just started in Florida, that's outside this analysis.

Progress Energy actually projects DECREASING impacts of conservation, in spite of national trends favoring more efficiency. And those trends are used as an argument that there's nothing left to do: "...The adoption of increasingly stringent national appliance standards for most major energy-using equipment and the adoption of energy efficiency requirements in state building codes. These mandates have further reduced the potential for cost-effective utility-sponsored measures."

What is this supposed to mean? That governments and states have done so much there's nothing left for a poor utility to do in this area? On the contrary, what remains is the gigantic gap between the brand new appliances and systems and actually getting them into customer's homes, thus reducing their demand, or getting the customers into more energy efficient homes, or upgrading their homes to these new codes.

The past, present or future creation of new codes for building and/or appliances create increasing gaps between current use and future use of electricity. Without some incentive to increase the rate of adoption these standards and requirements don't have a large immediate impact on overall demand. However, they may well have a significant impact by 2026-2046 which is the period this report is supposed to cover. (HNP-WW-1)

Comment: Conservation: Conservation options should consider what might be feasible 20 years from now, and not based on what is available today, under various adoption rate scenarios, including with incentives, and what could be developed in future. (HNP-WW-5)

Comment: I have been doing my best to get in touch with you. But I do believe that some companys have done their best to hide me from you. Right down to N.C. News & Observer, I have written them (N&O) 5 straight times trying to get them to put me in touch with the right people. I have invented a power source that is inexpensive and 95% safe to the consumer & the world. It is a fully self sustaining electrical power/generator, this invention will power anything & everything electrical that we have created thus far. But I believe for the sake of the companys losing out on millions of dollars they have made up their minds to try and hide this discovery from you & the rest of the world. So I have been fighting against all odds to get national attention to what I have named I AM COIL. This engine/generator will change the way we suppy power to our homes, offices & business. Because instead of wires running for miles & miles, we will be able to place one small I Am Coil (3 feet wide x 4 feet high x 7 feet long) on the building or home lot of land in which it sits on. And I need not tell you how great a benefit that will be in storms, floods & summer. This is a great invention and it should be put into full production starting now. If you truely (sic) do care about our safety & making the world a great place to live for our kids, then I will see you at this prison no later than 3 days after you have received this letter. Then I will take you through the whole system of the I Am Coil, and explain to you how it works from top to bottom. And when I finish you will know for yourself that it truely works and works good, forget about me being in prison & look at what I have invented, that is the most important subject here. I stay off to myself & I don't let to (sic) many people know what I have created in here, because it is a multi billion dollar invention. And like my Grandfather use to say talk is cheap, action is more, so come & see this invention for yourself. I will be waiting for you to show up. (HNP-XX-1)

Response: *The comment is noted. Impacts from reasonable alternatives for the Shearon Harris Nuclear Power Plant, Unit 1, will be evaluated in Chapter 8 of the SEIS.*

A.1.12 Environmental Justice Issues

Comment: We learned that African-Americans, and other minorities, pay a disproportionate share of their income for energy, and these groups to be more acutely affected by air emissions from our transportation and energy sectors. We also learned that our communities tend to live in older housing stock, which isn't energy efficient, and usually has older, less efficient appliances, and heating and cooling systems. With these observations, as a back drop, we have determined that our constituents, and our communities, would be greatly served from measures that would ensure low cost, clean and reliable energy sources. (HNP-P-1)

Response: *In order to perform a review of environmental justice in the vicinity of a nuclear power plant, the NRC staff examines the geographic distribution of minority and low-income populations within 80 kilometers (50 miles) of the site. The NRC staff uses the most recent census data available. The NRC staff also supplements its analysis by field inquiries to such groups as county planning departments, social service agencies, agricultural extension personnel, and private social service agencies. Once the locations of minority and low-income populations are identified, the staff evaluates whether any of the environmental impacts of the* *proposed action could affect these populations in a disproportionately high and adverse manner.*

The comments relate to environmental justice issues and will be considered in the preparation of the SEIS. The NRC conducts an independent analysis of the impacts of license renewal with regard to environmental justice; potential impacts which are discussed in Chapter 4 of this SEIS.

A.1.13 Global Warming Issues

Comment: ...its operation is not contributing to the tropospheric loading of green house gases. (HNP-D-5)

Comment: Third issue, greenhouse gas emissions from the entire fuel cycle, from an additional 20 years of operation. Progress Energy, in its report said if we decommission the plant in 2026, or if we decommission the plant in 2046, oh what is the difference? Well, the difference is, among other things, significant quantities of various greenhouse gases are released during the entire fuel cycle, uranium fuel cycle, some of which are many times more damaging than carbon dioxide, such as those emitted during fuel fabrication. The plant specific environmental impact statement should consider all the greenhouse gas emissions, not just carbon dioxide, associated with extended operation for 20 years, beyond 2026, such as uranium mining, fuel fabrication, fuel transport, repair, replacement, manufacture and transport, to maintain the reactor, spent fuel transport, low level radioactive waste transport, low level radioactive waste incineration, and so on. (HNP-K-9)

Comment: The Harris plant is essential to meeting the needs of our customers and we meet those needs with zero greenhouse gas emissions. With very real concerns about global warming it is good for our customers and good for the environment to take steps now to ensure that the Harris plant continues to be that clean air energy source well into the future. Renewing the plant's license will allow us to do exactly that. A recent Bisconti research national survey determined that 85 percent of the public believe that the U.S. should take advantage of all low carbon energy opportunities in the future, including nuclear power. (HNP-M-1)

Comment: In addition, it is my belief that there is less environmental pollution from nuclear generation than a coal fired, or natural gas fired electricity generation source. There are no air pollutants being emitted. In an age where global warming appears a real issue, certainly nuclear power is the correct means of electricity generation for the future. (HNP-BB-2)

Comment: WHEREAS, nuclear energy produces no greenhouse gas emissions that contribute to global climate change; (HNP-KK-3)

Comment: WHEREAS, nuclear energy produces no greenhouse gas emissions that contribute to global climate change; (HNP-LL-3 through OO-3; SS-3 through UU-3)

Comment: WHEREAS, nuclear energy produces no greenhouse gas emissions that can lead to ozone formation or acid rain; **(**HNP-PP-3; QQ-3**)**

Comment: WHEREAS, nuclear energy produces no greenhouse gas emissions; (HNP-RR-3)

Response: *While climate change is a legitimate concern, the specific impacts of climate change within a particular region is still highly speculative, and is, therefore, beyond the scope of a NEPA review for reactor license renewal. The comments do not provide new and significant information; therefore, they will not be evaluated further.*

A.1.14 Issues Outside the Scope of License Renewal

Operational Safety, Security, & Emergency Preparedness

Comment: Since the initial licensing efforts, for the plant, Wake County and, at the time, CP&L, and subsequently Progress Energy, have had a continuing relationship. And that relationship includes financial planning, and work support, in development and maintenance of our emergency response plans, and other preparedness activities. And, as a result of that continuing collaborative effort, when we've ted our emergency response activities, it has been determined that we meet NRC and FEMA standards for emergency response external to the plant. In Wake County we actually conduct annual tests of that plan. In alternating years we either test the activation of the EOC only, or we activate the EOC and the field activities response for exercise purposes. And what I wanted to establish, for the record, was that current relationship with Progress Energy, in emergency planning and testing, and managing the emergency plan for Shearon Harris. (HNP-A-1)

Comment: I have had a chance to visit the plant and interface with Bob Duncan, and his management team. I have seen, first-hand, the security measures in place, and the dedication, and the commitment, of the entire Progress Energy team. (HNP-E-1)

Comment: This is a very safe plant, it has proven that it has stood the test of time, and it meets a very, very important part of our community and region's needs. (HNP-E-5)

Comment: Progress Energy has a proven 35 year track record of operating nuclear plants safely and securely. (HNP-H-2)

Comment: I'm here today representing 650 employees who work at the Harris plant, many of who are in the audience today to show their support. These are highly skilled, extensively trained professionals, who are dedicated and committed to their work. Understandably these employees, including me, are held to very high expectations. We are responsible for safely operating a nuclear reactor, and that is a huge responsibility. We come to work every day with our first priority not simply to generate electricity, but to make sure that we are generating electricity in a sustainable way, that ensures the health and safety of the public, and the environment. It is my responsibility to ensure that safety for our employees, and for our public. Safety has, and always will be, a top priority for the Harris plant. (HNP-M-3)

Comment: We do need to be environmentally responsible to concerns about global warming, and we need to be safe. One of our plants is about ten miles from the Harris plant. We are very pleased with Progress Energy's outstanding safety record, and are very confident in their ability to keep our employees safe. (HNP-O-3)

Comment: I have toured the plant at least four to five times, the total plant, inside, out, the whole nine yards. And I, personally, am very pleased and comfortable with their safety precautions. I would also encourage any elected officials who might be here, or others, to do the same thing that I have done, take a look at the plant, go through the whole thing, you will be impressed. (HNP-T-2)

Comment: The Harris plant has been operating for 18 years and, over that time, has consistently been ranked, by its peers, as among the top nuclear plants in the country, in terms of safety, production, and cost. Progress Energy has a 35 year track record of operating nuclear plants safely, and securely. The Harris plant continuously updates equipment, and undergoes constant oversight and scrutiny by the Nuclear Regulatory Commission. (HNP-EE-3)

Comment: In the past three years I have had the opportunity to become involved with the local section of the American Nuclear Society. In the numerous society functions and meetings I have attended, I have interacted extensively with personnel from Progress Energy, both from the corporate offices, and the Harris plant. Without exception I have found these professional men and women to be of the highest caliber, possessing a good questioning attitude, and ensuring understanding of the technical concepts presented at section meetings. Their strong commitment to their profession, and to excellence and safety in nuclear plant operations, is evident. (HNP-FF-4)

Comment: As Ms. Alexander spoke to, I can also attest to being a part of seeing, first-hand the conservative decisionmaking that is used in our nuclear safety programs to ensure the highest degree of safety to employees, the plant, and the public. My husband and I, after having different assignments in other states, moved back to North Carolina, and chose to locate in Apex, North Carolina. I currently volunteer in the emergency department in a local hospital. And when nuclear power is brought up I have the opportunity to talk with residents, and I tell them, and I'm genuine in saying this, if there were a natural disaster, the first place I would want to be would be inside the containment building at the Shearon Harris nuclear power plant. (HNP-JJ-2)

Comment: WHEREAS, the Harris Plant has been consistently ranked by its peers among the top nuclear plants in the country in terms of safety, production and cost; and WHEREAS, Progress Energy has a 35-year track record of operating nuclear plants safely and securely, and the plant features multiple backup systems to ensure safety; and WHEREAS, the Harris Plant is closely monitored by on-site inspectors from the Nuclear Regulatory Commission; and WHEREAS, the 650 professionals who work at the plant and live in the community are committed to the safety and security of the site; (HNP-KK-2 through OO-2; RR-2 through UU-2)

Comment: WHEREAS, the Harris Plant has been consistently ranked by its peers as among the top nuclear plants in the country in terms of safety, production, and cost; and WHEREAS, Progress Energy has a 35-year track record of operating nuclear plants safely and securely; (HNP-PP-2; QQ-2)

Comment: WHEREAS, the 650 professionals who work at the plant and live in the community are committed to the safety and security of the site; (HNP-PP-5; QQ-5)

Response: *The comments are noted. Operational safety, security, and emergency preparedness is outside the scope of this review. An NRC safety review for the license renewal period is conducted separately. Although a topic may not be within the scope of review for license renewal, the NRC is always concerned with protecting health and safety. Any matter potentially affecting safety can be addressed under processes currently available for an existing operating license absent a license renewal application.*

Emergency preparedness is an ongoing process at all plants, including HNP. Each nuclear plant must have an approved emergency plan, as required by 10 CFR Part 50, that is revised periodically and required to be updated. Licensees are required to frequently test the effectiveness of the plans by conducting emergency response exercises. Emergency planning is part of the current operating license and is outside the scope of the environmental analysis for license renewal. The comments did not provide any new and significant information and do not fall within the scope of license renewal as set forth in 10 CFR Parts 51 and 54; therefore, the comments will not be evaluated further.

Security

Comment: I have been around for over 80 years. And as far as the Nuclear Regulatory Commission, I have been around from the get-go. And I supervised security offices back in the '70s. And all the blab, and all the blurb from Progress Energy, I can sum up in one little statement from every security officer I supervised in five different atomic energy plants, in the northeast. Anything happens here, bud, I'm the first one out the gate. And this is all security officers I'm referring to, who I supervised. You have no real security if a major accident occurs. And we have just been going along hoping that they spot a fire, like they did back in '93, before it becomes a major conflagration. (HNP-C-4)

Response: *As part of its oversight process the NRC constantly ensures that licensees meet appropriate security levels.*

The issue of security at nuclear power plants is not unique to facilities that have requested a renewal to their license; therefore, security will not be addressed within the scope of this SEIS. The comments did not provide new and significant information and do not fall within the scope of license renewal as set forth in 10 CFR Parts 51 and 54; therefore, will not be evaluated further.

Aging Management

Comment: Now, there are several reasons not to extend the license of Shearon Harris nuclear plant. The most important is that Shearon Harris has been stalling, for 15 years, and now asks for another ten years to correct the wiring of firewalls. This is material installed, originally, by the builders of Shearon Harris and approved by you, the NRC. Shearon Harris is spending 500,000 dollars a year on a fire watch system, again, approved by the NRC, hoping to prevent a major fire. (HNP-C-1)

Comment: The next reason not to extend the license is that it was built to last 40 years, only, and it is wearing out, much as a car that was built to last 100,000 miles, and has run over 550,000 miles. There are parts of the plant that cannot be measured for durability, and us life, just as an old car engine and drive train can only be estimated. When a piece of equipment is designed for 40 years of use, there are hidden weaknesses to consider. It ages. Let's wait ten more years before we consider a license renewal. (HNP-C-2)

Comment: In terms of plant aging issues and those affects on the public health and the environment, aging of plant systems is the only area, other than environmental issues, that the NRC is supposed to consider in relicensing a plant or not. But this is the one area that is very impossible to predict so far in advance. During the first 20 to 30 years of U.S. power reactor operation numerous systems and components have turned out to age and deteriorate more rapidly than expected, and to be missed by routine inspections. It seems extremely likely that additional generic aging issues will emerge in the next 5, 10, and 20 years if U.S. power reactors continue to operate. It simply is not credible that either Progress Energy, or the NRC, can predict additional aging effects 40 years into the future. Two dangerous examples of such unforeseen issues that have emerged in recent years are reactor head corrosion, and the pressurized water reactor problem with butt welds. These appear to be -- there are likely to be many more as reactors age. A responsible regulator would not tie its hands so far in advance, but would retain the authority to shut down nuclear reactors that can no longer be operated safely. (HNP-K-3)

Comment: WHEREAS, the Harris Plant is continually updating equipment and undergoes constant oversight and scrutiny by the Nuclear Regulatory Commission; (HNP-PP-4; QQ-4)

Response: *The comment is noted. The NRC's environmental review is confined to environmental matters relevant to the extended period of operation requested by the applicant. Safety matters related to aging are outside the scope of this environmental review. An NRC safety review for the license renewal period is conducted separately. The comments provide no new information and will not be evaluated further in the context of the environmental review. However, the comments were forwarded to the project manager for the license renewal safety review for consideration.*

Need for Power

Comment: Shearon Harris is contributing to the provision of the base load of electricity that we, the consumers, are demanding. It is contributing to our national goal of energy independence (HNP-D-4)

Comment: I have lived in Fuquay for over 30 years, and continue to count on Progress Energy to provide the electricity needed for our community, and the region, and recognize that the Shearon Harris plant has been a part of providing infrastructure, and meeting the tremendous growth that has taken place in our area. I'm satisfied, in fact, that we could not have had this type of growth if we hadn't had the type of energy needed for this region. And the Harris plant has met those demands. (HNP-E-3)

Comment: The agency [North Carolina Eastern Municipal Power Agency], the power agency, owns 16.17 percent of the Harris nuclear plant. The Harris nuclear plant provides safe and reliable power to more than 250,000 power agency customers. The Harris plant is important to Progress Energy to ensure reliable power to both and all of its customers. The plant does not depend on imported fuel and is environmentally responsive to concerns of global warming. (HNP-F-1)

Comment: And, lastly, the agency [North Carolina Eastern Municipal Power Agency] owns 16.17 percent of the Shearon Harris nuclear generating plant, located in southwest Wake County, in North Carolina. And that is the subject of this operating license renewal hearing today. The rated capacity of this plant is 900 megawatts. The agency's share of the Shearon Harris plant's output is 146 megawatts. This represents about 10 percent of the capacity that is owned by the agency's generating capacity, and 12 percent of the energy requirements. The Harris plant has provided safe, secure, economical power to the agency, its members, and customers, for almost 20 years. Should the NRC not grant an operating license renewal for the Harris plant, beginning in 2027, the agency, including the town of Clayton, would have to purchase power from other sources to meet the requirements of its customers. (HNP-G-1)

Comment: The Harris plant supplies power to more than 550,000 businesses and residences, or about 12 percent of the total electricity generated by PE Carolinas. Continued operation of the Harris plant will result in no greenhouse gas emissions, and reduce dependence upon unstable foreign energy supplies. (HNP-H-3)

Comment: Over the past 12 months our area has received many high rankings and accolades; number one place for business, and careers, by Forbes, number eight fastest growing metro in the nation by the U.S. Census Bureau; number one best U.S. city for job, Forbes; top 50 hottest cities for expanding and relocating companies; top ten tech town; Wake County number one school district, and the Wake County's schools gold rating from Expansion Management magazine. What those ratings suggest is that dynamic growth that has taken place in this market is likely to continue. And that kind of growth requires energy to meet new demand. The Shearon Harris plant currently supplies more than a half million residences and businesses, and provides 12 percent of the total energy generated by Progress Energy of the Carolinas. And the plant generates more than 7.9 million megawatt hours of electricity, and approximately ten million dollars in taxes to Wake County, annually. (HNP-J-1)

Comment: I'm also a customer of Progress Energy. I count on them to provide me, and the members I represent, with reliable power. The Harris plant is an important part of Progress Energy's plan to ensure reliable power at the least expensive cost to me, and other customers. (HNP-L-2)

Comment: I'm also currently the finance chair of the Board of Directors of Wake Med Health and hospitals. The hospital system cannot operate without safe dependable power. Progress Energy has an unwavering commitment to all of Wake Med's hospitals and patients, that Wake County citizens depend on, every minute of every day. (HNP-O-6)

Comment: I have the opportunity to serve 16 counties in central and northern North Carolina for Progress Energy. And I also have this opportunity to ensure that our commercial, our industrial, and our residential customers receive the power to their homes, and their businesses. We must make sure that reliable, 24/7 flow of power, is there to meet their needs each and every day. And, especially, for those hospitals, the fire and police departments, and for our industrial customers, often who can't even tolerate a flick within their power flow. So continuous power is needed. The Harris plant is an important, no it is essential, it is an essential part to a balanced solution, to meeting all of our customers needs. So we are applying to renew the Harris plant's operating license because we have responsibility to serve our customers, to ensure they have power today, and for tomorrow. (HNP-S-1)

Comment: And, in summary, due to the rapid growth in our area, in particular Holly Springs, we are moving in 2.7 families every day. We need Shearon Harris and we need the electricity. (HNP-T-3)

Comment: As the fourth fastest growing state in America, and the tenth largest state in the country, business needs reliable, affordable, and clean energy, to compete, to create jobs, and drive the continued economic growth of our state. There are many reasons that make our state the envy of most in the country. Maintaining and improving our competitive position, as a state, is the primary mission of the North Carolina Chamber. And the competition to grow jobs, and expand, costs matter. Energy drives North Carolina business, it drives our economy, and creates opportunities for all of us. (HNP-X-2)

Comment: We have experienced quality sustainable growth that is the envy of many other communities. The local investment by companies, that are moving here, and the jobs that they are creating for our growing population, have done much to enhance the quality of life that all of us appreciate and enjoy. Key to that past growth, and to its sustainability, as we move forward, has been, and will continue to be, an adequate supply of quality power. The ability to meet our electrical demands is critical. If we cannot say, with certainty, that an adequate supply of electrical power is available, we will no longer be able to attract these investments, and new jobs to our area. (HNP-AA-1)

Comment: Without reading the entire resolution we support the license extension based on renewing the Harris plant's license will ensure Progress Energy can continue to meet the growing Triangle area's need for electricity in a safe, efficient, and affordable manner. The Harris plant provides electricity to more than 55,000 residents, and businesses, in the Triangle. (HNP-EE-2)

Comment: WHEREAS, renewing the Harris Plant's operating license will help ensure that Progress Energy can continue to provide the electricity needed for the growing Triangle region; and WHEREAS, the Harris Plant supplies power to more than 550,000 residencies and businesses, and provides 12 percent of the total electricity generated by PE Carolinas; and WHEREAS, in 2005, the Harris Plant generated more than 7.9 million megawatt-hours of electricity, the largest volume in its 18 years of operation; (HNP-KK-1 through OO-1; RR-1 through UU-1)

Comment: WHEREAS, nuclear power helps the United States reduce dependence on unstable foreign energy supplies; (HNP-KK-4 through OO-4; RR-4 through UU-4)

Comment: WHEREAS, renewing the Harris Plant's operating license will ensure that Progress Energy can continue to provide the electricity needed for the growing Triangle region; and WHEREAS, the Harris Plant supplies power to more than 550,000 residences and businesses, and provides 12 percent of the total electricity generated by PE Carolinas; and WHEREAS, In 2005, the Harris Plant generated more than 7.9 million megawatt-hours of electricity, the largest volume in its 18 years of operation; (HNP-PP-1; QQ-1)

Comment: Renewing the Harris Plant's operating license will ensure that Progress Energy can continue to provide the electricity needed to fuel the growing Triangle region far into the future. As an organization that is committed to improving the quality of life of residents in the Triangle, the Urban League recognizes that renewing the license at the Harris Plant is also a key part of Progress Energy's balanced solution to meeting the growing energy needs of our region. (HNP-VV-2)

Response: *The need for power is considered to be outside the scope of license renewal (10 CFR 51.95 (c)(2)). The purpose and need for the proposed action (renewal of an operating license) is to provide an option that allows for power generation capability beyond the term of a current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, and where authorized, Federal (other than NRC) decision makers. The comments are outside the scope of the license renewal review; therefore, will not be evaluated further.*

Cost of Power

Comment: We also have an obligation to produce power in a cost effective way. The Harris plant helps Progress Energy do that. We consistently rank high in the industry in this category. And in 2002 and 2005 the Harris plant was the lowest cost energy provided, in dollars per megawatt generated, of any nuclear plant in the country. (HNP-M-4)

Comment: Nuclear power helps Progress Energy protects customers from price volatility, ensures a reliable supply of energy. We do not need to depend on imported fuels. (HNP-O-2)

Comment: With the current volatility in the fossil fuels market, we believe that the stable cost of nuclear power has had a positive effect on our local rates with respect to fuel adjustment. Our members and constituents want continued access to low cost energy, as we see it as necessary to having a growing economy, and the quality of life which we have grown accustomed to. (HNP-P-2)

Comment: The nuclear power generated at Harris is the lowest cost option, and it produces no greenhouse gases that contribute to global climate change. (HNP-S-2)

Comment: My company is being asked to compete in a large international market and environment. The game has changed rapidly in the last few years. The cost of electricity is one of the few areas we have an advantage over foreign competition. Electricity is cheaper, and more dependable, in the United States than in overseas locations. We certainly want to retain that cost advantage. Our plants are in rural North Carolina, all manufacturing jobs are meaningful in those areas. For an electrical utility nuclear power is the lowest cost source of generating electricity on a large scale. I wish Progress Energy had more nuclear generated electricity. Without the cost of nuclear generated electricity averaged into the overall cost of all electricity generated by Progress Energy, the cost would force some industrial manufacturing companies to shut their doors, or relocate to areas with competitive electricity costs. (HNP-BB-1)

Response: *The comments are noted. The economic costs and benefits of renewing an operating license are specifically directed to be outside the scope of license renewal in 10 CFR 51.95(c)(2). The comments provide no new and significant information and, therefore, will not be evaluated further.*

Appendix B

Contributors to the Supplement

Appendix B:
Contributors to the Supplement

The overall responsibility for the preparation of this supplement was assigned to the Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission (NRC). The supplement was prepared by members of the Office of Nuclear Reactor Regulation with assistance from other NRC organizations and Lawrence Livermore National Laboratory.

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(a) Lawrence Livermore National Laboratory is operated for the U.S. Department of Energy by Lawrence Livermore National Security, LLC.

Appendix C

Chronology of NRC Staff Environmental Review Correspondence Related to Carolina Power & Light Company Application for the License Renewal of Shearon Harris Nuclear Power Plant, Unit 1

Appendix C:
Chronology of NRC Staff Environmental Review Correspondence Related to Carolina Power & Light Company Application for the License Renewal of Shearon Harris Nuclear Power Plant, Unit 1

This appendix contains a chronological listing of correspondence between the U.S. Nuclear Regulatory Commission (NRC) and Carolina Power & Light Company, doing business as Progress Energy Carolinas, Inc. (CP&L) and other correspondence related to the NRC staff's environmental review, under Title 10 of the *Code of Federal Regulations*, Part 51 (10 CFR Part 51), of the CP&L application for renewal of the Shearon Harris Nuclear Power Plant, Unit 1 (HNP) operating license. All documents, with the exception of those containing proprietary information, are publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland, 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.htm. The ADAMS accession numbers for each document are included below. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail at pdr@nrc.gov.

November 14, 2006	Letter from C. Gannon, CP&L, submitting the application for renewal of the operating license for the HNP. (Accession No. ML063350267)
November 14, 2006	Shearon Harris N*uclear Power Plant, Unit 1 — License Renewal Application, Applicant's Environmental Report*. (Accession No. ML063350276)
December 8, 2006	NRC press release announcing the availability of the license renewal application for Shearon Harris Nuclear Power Plant. (Accession No. ML063420172)
December 5, 2006	Letter to C. Gannon, CP&L, Receipt and Availability of the License Renewal Application for Shearon Harris Nuclear Power Plant. (Accession No. ML063210237)

December 11, 2006	*Federal Register* Notice of Receipt and Availability of Application for Renewal of Shearon Harris Nuclear Power Plant Facility Operating License No. NPF-63 for an Additional 20-Year Period (71 FR 71586). (Accession No. ML071770522)
January 8, 2007	Determination of Acceptability and Sufficiency for Docketing the Application from Carolina Power and Light Company, for the renewal of the operating license for the Shearon Harris Nuclear Power Plant, Unit 1. (Accession No. ML063520336)
January 12, 2007	*Federal Register* Notice of Acceptance for Docketing of the Application for Facility Operating License No. NPF-63 for an Additional 20-Year Period; Carolina Power and Light Company, Shearon Harris Nuclear Power Plant, Unit 1 (72 FR 1562). (Accession No. ML071730450)
March 1, 2007	Letter to S. Cropps, Eva H. Perry Library, regarding the maintenance of reference material at the Eva H. Perry Library, related to the Shearon Harris Nuclear Power Plant license renewal application. (Accession No. ML063600236)
March 7, 2007	Letter from D. Corlett (CP&L) to U.S. NRC staff, regarding notification of NPDES permit renewal for HNP. (Accession No. ML070740432)
March 14, 2007	Proposed review schedule, intent to prepare an environmental impact statement and opportunity for a hearing regarding the application from Carolina Power & Light Company, for Renewal of the operating license for the Shearon Harris Nuclear Power Plant. (Accession No. ML070230076)
March 20, 2007	*Federal Register* Notice of Opportunity for Hearing, and Notice of Intent to Prepare an Environmental Impact Statement and Conduct the Scoping Process for Facility Operating License No. NPF-63 for an Additional 20-Year Period; Carolina Power & Light Company, Shearon Harris Nuclear Power Plant, Unit 1 (72 FR 13139). (Accession No. ML070790140)
March 20, 2007	Letter to D. L. Kilma, Advisory Council on Historic Preservation Concerning the Shearon Harris Nuclear Power Plant License Renewal Application Review. (Accession No. ML070220273)

March 20, 2007	Letter to J. Crow, North Carolina State Historic Preservation Officer, Request for Comments Concerning the Shearon Harris Nuclear Power Plant License Renewal Application Review. (Accession No. ML063600188)
March 20, 2007	Letter to T. Lewis, Meherrin Indian Tribe, Request for Comments Concerning the Shearon Harris Nuclear Power Plant License Renewal Application Review. (Accession No. ML070220278)
March 20, 2007	Letter to R. Richardson, Haliwa Saponi Tribe, Request for Comments Concerning the Shearon Harris Nuclear Power Plant License Renewal Application Review. (Accession No. ML070230098)
March 20, 2007	Letter to M. Hicks, Eastern Band of Cherokee, Request for Comments Concerning the Shearon Harris Nuclear Power Plant License Renewal Application Review. (Accession No. ML070230127)
March 20, 2007	Letter to J. Goins, Lumbee Tribe of North Carolina, Request for Comments Concerning the Shearon Harris Nuclear Power Plant License Renewal Application Review. (Accession No. ML070230142)
March 20, 2007	Letter to G. Faircloth, Coharie Tribe, Request for Comments Concerning the Shearon Harris Nuclear Power Plant License Renewal Application Review. (Accession No. ML070230167)
March 21, 2007	NRC press release announcing the Hearing Opportunity and Intent to Develop Environmental Report on Harris Nuclear Plant License Renewal. (Accession No. ML070800277)
March 27, 2007	Letter to S. Hamilton, U.S. Fish and Wildlife Service Southeast Regional Office, Request for List of Protected Species Within the Area Under Evaluation for the Shearon Harris Nuclear Power Plant License Renewal Application Review. (Accession No. ML070220281)
March 27, 2007	Letter to L. Pearsall, North Carolina Natural Heritage Program, Request for List of State Protected Species Within the Area Under Evaluation for the Shearon Harris Nuclear Power Plant License Renewal Application Review. (Accession No. ML070220337)

March 27, 2007	Letter to R. Duncan, CP&L, Request for Additional Information Regarding Severe Accident Mitigation Alternatives for Shearon Harris Nuclear Power Plant. (Accession No. ML070740160)
March 28, 2007	Letter to R. Duncan, CP&L, Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process for License Renewal for the Shearon Harris Nuclear Power Plant. (Accession No. ML063600250)
April 11, 2007	NRC press release announcing public meetings to discuss the license renewal review process for and to solicit public comments on the scope of the environmental review for Shearon Harris (Accession No. ML071010055)
April 12, 2007	Summary of telephone conference call held on March 27, 2007, between NRC and CP&L, concerning draft request for additional information pertaining to Shearon Harris Nuclear Power Plant. (Accession No. ML070930289)
April 15, 2007	Letter from R. Williams, concerning the Shearon Harris Nuclear Power Plant license renewal application. (Accession No. ML071210160)
April 18, 2007	Letter from L. Cullington, Comments on Shearon Harris License Renewal Environmental Scoping. (Accession No. ML071150313)
April 18, 2007	Letter from B. Duncan, Comment concerning the Shearon Harris Nuclear Power Plant license renewal application. (Accession No. ML071210163)
April 18, 2007	Meeting Transcript for Shearon Harris, Unit 1, License Renewal Public Meeting Afternoon Session (Accession Nos. ML071300371)
April 18, 2007	Meeting Transcript for Shearon Harris, Unit 1, License Renewal Public Meeting Evening Session (Accession Nos. ML071300377)
April 26, 2007	Letter from H. LeGrand, North Carolina State Natural Heritage Program, Renewal of Operating License for the Shearon Harris Nuclear Power Plant, Wake and Chatham Counties. (Accession Nos. ML071280403)

April 27, 2007	Letter to K. O'Daly, West Regional Library, regarding the maintenance of reference material at the West Regional Library, related to the review of the Shearon Harris Nuclear Power Plant license renewal application. (Accession No. ML071140313)
May 2, 2007	Letter from C.D. Vaughn, Advisory Council on Historic Preservation, Notification pursuant to 36 CFR 800.8(c), Proposed Shearon Harris Nuclear Power Plant License Renewal Wake County, North Carolina. (Accession Nos. ML071300272)
May 10, 2007	Letter from T. Natale, CP&L, Response to Request for Additional Information Regarding Severe Accident Mitigation Alternatives for Shearon Harris Nuclear Power Plant. (Accession Nos. ML071410135)
May 14, 2007	Summary of Public Meetings Related to the Review of the Shearon Harris Nuclear Power Plant License Renewal Application. (Accession No. ML071200434)
May 21, 2007	Letter to R. Duncan, CP&L, Environmental Site Audit Regarding Shearon Harris Nuclear Power Plant License Renewal Application. (Accession No. ML071360138)
June 25, 2007	Summary of Telephone Conference Call 6-13-2007, Between NRC and CP&L, Concerning SAMA Analysis of the Shearon Harris Nuclear Power Plant License Renewal Application. (Accession No. ML071690054)
July 06, 2007	Summary of Site Audit Related to the Review of the License Renewal Application for Shearon Harris Nuclear Power Plant, Unit 1. (Accession No. ML071700428)
July 12, 2007	Letter to R. Duncan, CP&L, Request for Additional Information Regarding the Environmental Review for Shearon Harris Nuclear Power Plant License Renewal Application. (Accession No. ML071660322)
August 08, 2007	Letter from C. Burton, CP&L, Response to Request for Additional Information Regarding the Environmental Review for Shearon Harris Nuclear Power Plant License Renewal Application. (Accession No. ML072290474)

August 09, 2007	Letter to R. Duncan, CP&L, Environmental Scoping Summary Report Associated with the Staff's Review of the Shearon Harris Nuclear Power Plant License Renewal Application. (Accession No. ML071980184 and ML071980195)
August 27, 2007	Letter from T. Natale, CP&L, Documentation of Changes to Severe Accident Mitigation Analysis for Shearon Harris Nuclear Power Plant License Renewal Application. (Accession No. ML072490033)
October 05, 2007	Letter from C. Burton, CP&L, Discussion of the Impact of Errors in the SECPOP2000 Computer Code on the Severe Accident Mitigation Alternatives Analysis for Shearon Harris Nuclear Power Plant License Renewal. (Accession No. ML072840455)
October 31, 2007	Docketing of Email Communication Between USNRC and Progress Energy Staff, Related to the Environmental Review of the Shearon Harris Nuclear Power Plant License Renewal Application. (Accession No. ML072960078)

Appendix D

Organizations Contacted

Appendix D: Organizations Contacted

During the course of the U.S. Nuclear Regulatory Commission staff's independent review of environmental impacts from operations during the renewal term, the following Federal, State and local agencies, and Native American Tribal agencies were contacted:

Advisory Council on Historic Preservation, Washington, DC

Coharie Tribe, Clinton, NC

Eastern Band of Cherokee, Cherokee, NC

Haliwa Saponi Tribe, Hollister, NC

Lumbee Tribe of North Carolina, Red Spring, NC

Meherrin Indian Tribe, Ahoskie, NC

North Carolina Department of Environment and Natural Resources, Raleigh, NC

North Carolina Natural Heritage Program, Raleigh NC

North Carolina State Historic Preservation Office, Raleigh, NC

North Carolina Wildlife Resources Commission, Raleigh NC

Town of Apex, NC

Town of Fuquay Varina, NC

Town of Holly Springs, NC

US Fish and Wildlife Service, Southeast Regional Office, Atlanta, GA

Appendix E

Carolina Power & Light Company, Compliance Status and Consultation Correspondence

Appendix E:
Carolina Power & Light Company, Compliance Status and Consultation Correspondence

Consultation correspondence related to the evaluation of the application for renewal of the operating license for the Shearon Harris Nuclear Power Plant, Unit 1 (HNP) is identified in Table E-1. Copies of the consultation correspondence are included at the end of this appendix.

The licenses, permits, and other approvals obtained from Federal, State, regional, and local authorities for HNP, are listed in Table E-2.

Table E-1. Consultation Correspondence

Source	Recipient	Date of Letter
U.S. Nuclear Regulatory Commission (R. Franovich)	Advisory Council on Historic Preservation (D.L. Kilma)	March 20, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	North Carolina State Historic Preservation Office (J. Crow)	March 20, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	Meherrin Indian Tribe (T. Lewis)	March 20, 2007[a]
U.S. Nuclear Regulatory Commission (R. Franovich)	Haliwa Saponi Tribe (R. Richardson)	March 20, 2007[a]
U.S. Nuclear Regulatory Commission (R. Franovich)	Eastern Band of Cherokee (M. Hicks)	March 20, 2007[a]
U.S. Nuclear Regulatory Commission (R. Franovich)	Lumbee Tribe of North Carolina (J. Goins)	March 20, 2007[a]
U.S. Nuclear Regulatory Commission (R. Franovich)	Coharie Tribe (G. Faircloth)	March 20, 2007[a]
U.S. Nuclear Regulatory Commission (R. Franovich)	U.S. Fish and Wildlife Service Southeast Regional Office (S. Hamilton)	March 27, 2007
U.S. Nuclear Regulatory Commission (R. Franovich)	North Carolina Natural Heritage Program (L. Pearsall)	March 27, 2007
North Carolina Natural Heritage Program (H. LeGrand)	U.S. Nuclear Regulatory Commission (R. Franovich)	April 26, 2007
Advisory Council on Historic Preservation (C.D. Vaughn)	U.S. Nuclear Regulatory Commission (R. Franovich)	May 2, 2007

(a) Similar letters were sent to listed Indian Nations.

Table E-2. Federal, State, Local, and Regional Licenses, Permits, and Other Approvals for the Shearon Harris Nuclear Power Plant (HNP)

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
U.S. Nuclear Regulatory Commission	Atomic Energy Act, 10 CFR 50	License to operate	NPF-63	October 24, 2026	Authorization to operate HNP.
U.S. Department of Transportation	49 CFR 5108	Hazardous Materials Shipment Certificate of Registration	060707 551 070P	June 30, 2008	Authorization to ship hazardous materials.
U.S. Fish and Wildlife Service	16 USC 703-712	Federal Fish and Wildlife Permit, Depredation	MB789112-0	March 31, 2008	Removal and recollection of migratory bird nests.
NC Department of Environment and Natural Resources	NC General Statute 143-215.1	National pollutant Discharge Elimination System Permit	NC0039586	July 31, 2011	Permit to discharge wastewaters to waters of the State.
NC Department of Environment and Natural Resources	NC General Statute Article 21B Chapter 143	Air Permit	08455R04	February 29, 2012	Air emissions for boilers and emergency generators source operations.
NC Department of Environment and Natural Resources	NC General Statute Title 15A Subchapter 2N, Section 0300	Underground Storage Tank Operating Permit	0-006715	December 31, 2007	Authorization to operate underground storage tank.
NC Wildlife Resources Commission	NC General Statute 113-274(c)(1)(a) Title 15A Subchapter 10B.0106	Special Migratory Bird Permit		December 31, 2007	Removal and relocation of migratory bird nests.

Agency	Authority	Requirement	Number	Expiration Date	Authorized Activity
South Carolina Department of Health and Environmental Control	South Carolina Radioactive Waste Transportation and Disposal Act (Act No. 429)	South Carolina Radioactive Waste Transport Permit	0324-32-07-X	December 31, 2007	Transportation of radioactive materials into the State of South Carolina.
Tennessee Department of Environment and Conservation	Tennessee Department of Environment and Conservation Rule 1200-2-10.32	Tennessee Radioactive Waste License for Delivery	T-NC002-L07	December 31, 2007	Transportation of radioactive materials into the State of Tennessee

March 20, 2007

Mr. Don L. Klima, Director
Advisory Council on Historic Preservation
Office of Federal Agency Programs
1100 Pennsylvania Ave., NW, Suite 803
Washington, DC 20004

SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Klima:

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing an application to renew the operating license for Shearon Harris Nuclear Power Plant (HNP), which is located in the southwest corner of Wake County, North Carolina. The city of Raleigh, North Carolina is approximately 16 miles northeast of the plant. HNP is operated by Carolina Power & Light Company (CP&L) doing business as Progress Energy Carolinas Inc. The application for renewal was submitted by CP&L in a letter dated November 14, 2006, pursuant to Title 10 of the *Code of Federal Regulations,* Part 54 (10 CFR Part 54).

The NRC has established that, as part of the staff's review of any nuclear power plant license renewal action, a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437, will be prepared under the provisions of 10 CFR Part 51, the NRC regulation that implements the National Environmental Policy Act of 1969 (NEPA). In accordance with 36 CFR 800.8(c), the SEIS will include analyses of potential impacts to historic and cultural resources.

On April 18, 2007, the NRC will conduct two public NEPA scoping meetings at the New Horizons Fellowship, 820 East Williams St., Apex, North Carolina 27502. You and your staff are invited to attend. The staff expects to publish the draft SEIS in December 2007.

If you have any questions or require additional information, please contact the Environmental Project Manager, Mr. Samuel Hernandez, by phone at 301-415-4049 or by email at shq@nrc.gov.

Sincerely,

/RA/

Rani Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-400

cc: See next page

March 20, 2007

Dr. Jeffrey J. Crow, SHPO
State Historic Preservation Officer
Division of Archives & History
4610 Mail Service Center
Raleigh, NC 27699-4610

SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT LICENSE RENEWAL APPLICATION REVIEW (SHPO NO. ER 05-2747)

Dear Dr. Crow:

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing an application to renew the operating license for Shearon Harris Nuclear Power Plant (HNP), which is located in the southwest corner of Wake County, North Carolina. The city of Raleigh, North Carolina is approximately 16 miles northeast of the plant, and the city of Sanford, North Carolina is approximately 15 miles southwest of the plant. HNP is operated by Carolina Power & Light, (CP&L) Company doing business as Progress Energy Carolinas Inc. The application for renewal was submitted by CP&L in a letter dated November 14, 2006, pursuant to Title 10 of the *Code of Federal Regulations,* Part 54 (10 CFR Part 54).

The NRC has established that, as part of the staff's review of any nuclear power plant license renewal action, a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," NUREG-1437, will be prepared under the provisions of 10 CFR Part 51, the NRC regulation that implements the National Environmental Policy Act of 1969 (NEPA). In accordance with 36 CFR 800.8(c), the SEIS will include analyses of potential impacts to historic and cultural resources.

In the context of the National Historic Preservation Act of 1966, as amended, the NRC staff ha: determined that the area of potential effect (APE) for a license renewal action is the area at the power plant site and its immediate environs that may be impacted by post-license renewal land-disturbing operations or projected refurbishment activities associated with the proposed action. The APE may extend beyond the immediate environs in those instances where post-license renewal land-disturbing operations or projected refurbishment activities specifically related to license renewal may potentially have an effect on known or proposed historic sites. This determination is made irrespective of ownership or control of the lands of interest.

On April 18, 2007, the NRC will conduct two public NEPA scoping meetings at the New Horizons Fellowship, 820 East Williams St., Apex, North Carolina 27502. You and your staff are invited to attend. Your office will receive a copy of the draft SEIS along with a request for comments. The staff expects to publish the draft SEIS in December 2007.

If you have any questions or require additional information, please contact Mr. Samuel Hernandez, Environmental Project Manager, by phone at 301-415-4049 or by email at shq@nrc.gov.

Sincerely,

/RA Jennifer Davis for/

Rani Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-400

cc: See next page

March 20, 2007

The Honorable Thomas Lewis, Acting Chief
Meherrin Indian Tribe
907-B US 13 South
Ahoskie, NC 27910

SUBJECT: REQUEST FOR COMMENTS CONCERNING SHEARON HARRIS NUCLEAR POWER PLANT LICENSE RENEWAL APPLICATION REVIEW

Dear Chief Lewis:

The U.S. Nuclear Regulatory Commission (NRC) is seeking input for its environmental review of an application from Carolina Power & Light Company (CP&L) doing business as Progress Energy Carolinas Inc., for the renewal of the operating license for the Shearon Harris Nuclear Power Plant (HNP), located in the southwest corner of Wake County, North Carolina. The city of Raleigh, North Carolina is approximately 16 miles northeast of the plant. HNP is in close proximity to lands that may be of interest to the Meherrin Indian Tribe. As described below, the NRC's process includes an opportunity for public and inter-governmental participation in the environmental review. We want to ensure that you are aware of our efforts and, pursuant to Title 10 of the *Code of Federal Regulations,* Part 51.28(b) (10 CFR 51.28(b)), the NRC invites the Meherrin Indian Tribe to provide input to the scoping process relating to the NRC's environmental review of the application. In addition, as outlined in 36 CFR 800.8(c), the NRC plans to coordinate compliance with Section 106 of the National Historic Preservation Act of 1966, through the requirements of the National Environmental Policy Act of 1969.

Under NRC regulations, the original operating license for a nuclear power plant is issued for up to 40 years. The license may be renewed for up to an additional 20 years if NRC requirements are met. The current operating license for HNP will expire on October 24, 2026. CP&L submitted its application for renewal of the HNP operating license in a letter dated November 14, 2006.

The NRC is gathering information for a HNP site-specific supplement to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437. The GEIS is a programmatic environmental impact statement; it documents the NRC's staff's assessment of environmental impacts that would be associated with license renewal at any nuclear power plant site. The supplement to the GEIS will contain the results of the review of the environmental impacts on the area surrounding the HNP site that are related to terrestrial ecology, aquatic ecology, hydrology, cultural resources, and socioeconomic issues (among others) and will contain a recommendation regarding the environmental acceptability of the license renewal action. Provided for your information is the HNP Site Layout and Transmission Line Map (Enclosure).

To accommodate interested members of the public, the NRC will hold two identical public scoping meetings for the HNP license renewal supplement to the GEIS on April 18, 2007, at the New Horizons Fellowship, 820 East Williams St., Apex, North Carolina 27502. The first meeting will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second meeting will convene at 7:00 p.m. and will continue until 10:00 p.m., as necessary. Additionally, the NRC staff will host informal discussions one hour before the start of each session.

The license renewal application (LRA) and the GEIS are publicly available at the NRC Public Document Room (PDR), located at One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852, or from the NRC's Agencywide Documents Access and Management System (ADAMS). The ADAMS Public Electronic Reading Room is accessible at http://adamswebsearch.nrc.gov/dologin.html. The accession number for the LRA is ML063350276. Persons who do not have access to ADAMS, or who encounter problems in accessing the documents located in ADAMS, should contact the NRC's PDR Reference staff by telephone at 1-800-397-4209, or 301-415-4737, or by e-mail at pdr@nrc.gov.

The HNP LRA is also available on the Internet at http://www.nrc.gov/reactors/operating/licensing/renewal/applications/harris.html. In addition, the Eva H. Perry Library, located at 2100 Shepherd's Vineyard Dr., Apex, North Carolina 27502, has agreed to make the LRA available for public inspection.

Please submit any comments that the Meherrin Indian Tribe may have to offer on the scope of the environmental review by May 19, 2007. Written comments should be submitted by mail to the Chief, Rules and Directives Branch, Division of Administrative Services, Mail Stop T-6D59, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Electronic comments may be submitted to the NRC by e-mail at ShearonHarrisEIS@nrc.gov. At the conclusion of the scoping process, the NRC staff will prepare a summary of the significant issues identified and the conclusions reached, and mail a copy to you.

T. Lewis -3-

The staff expects to publish the draft supplement to the GEIS in December 2007. The NRC will hold another set of public meetings in the site vicinity to solicit comments on the draft. A copy of the draft supplemental environmental impact statement (SEIS) will be sent to you for your review and comment. After consideration of public comments received on the draft, the NRC will prepare a final SEIS. The issuance of a final SEIS for HNP is planned for August 2008. If you need additional information regarding the environmental review process, please contact Mr. Samuel Hernandez, Environmental Project Manager, at 301-415-4049 or by e-mail at shq@nrc.gov.

Sincerely,

/RA Jennifer Davis for/

Rani L. Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-400

Enclosure:
As stated

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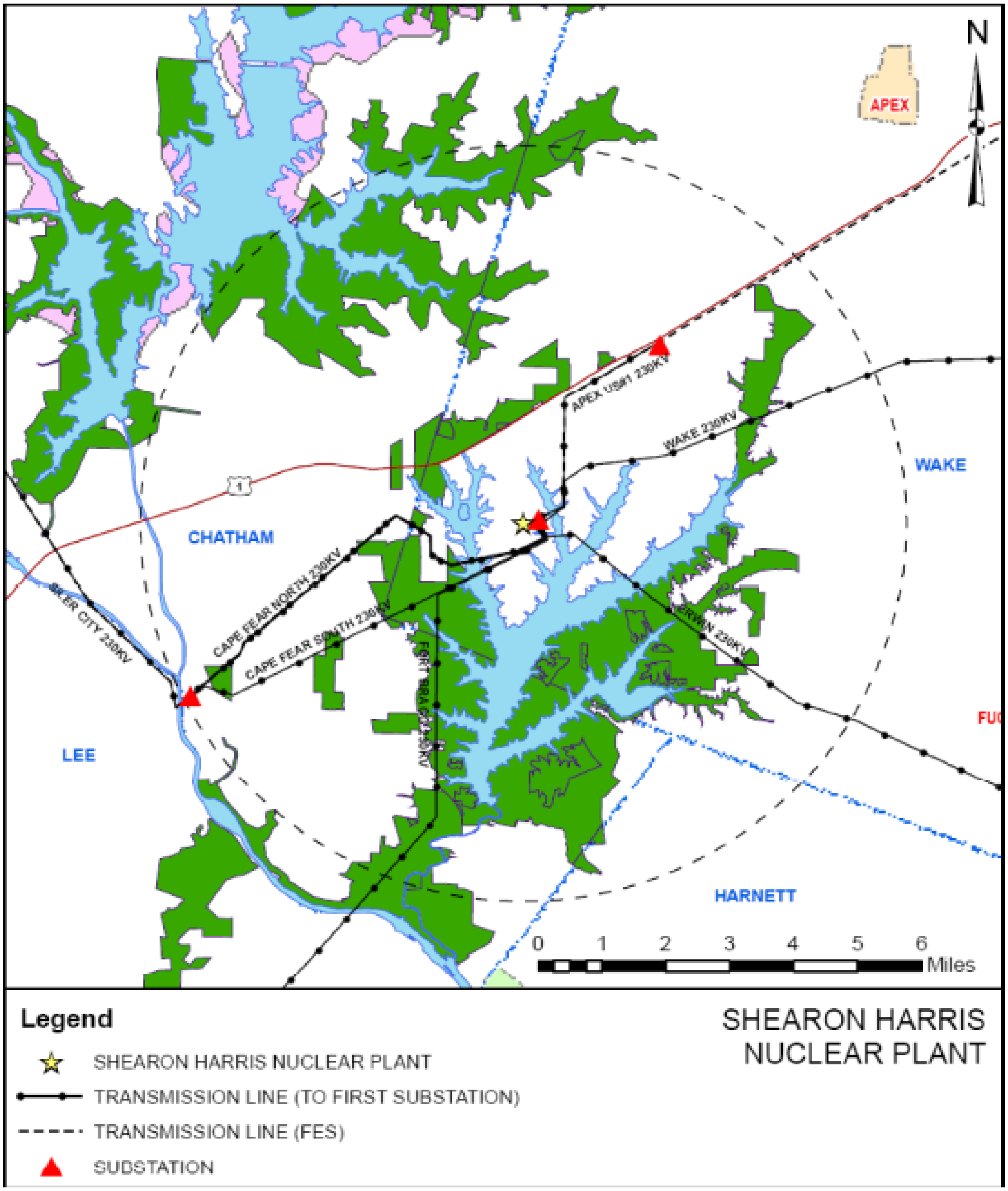
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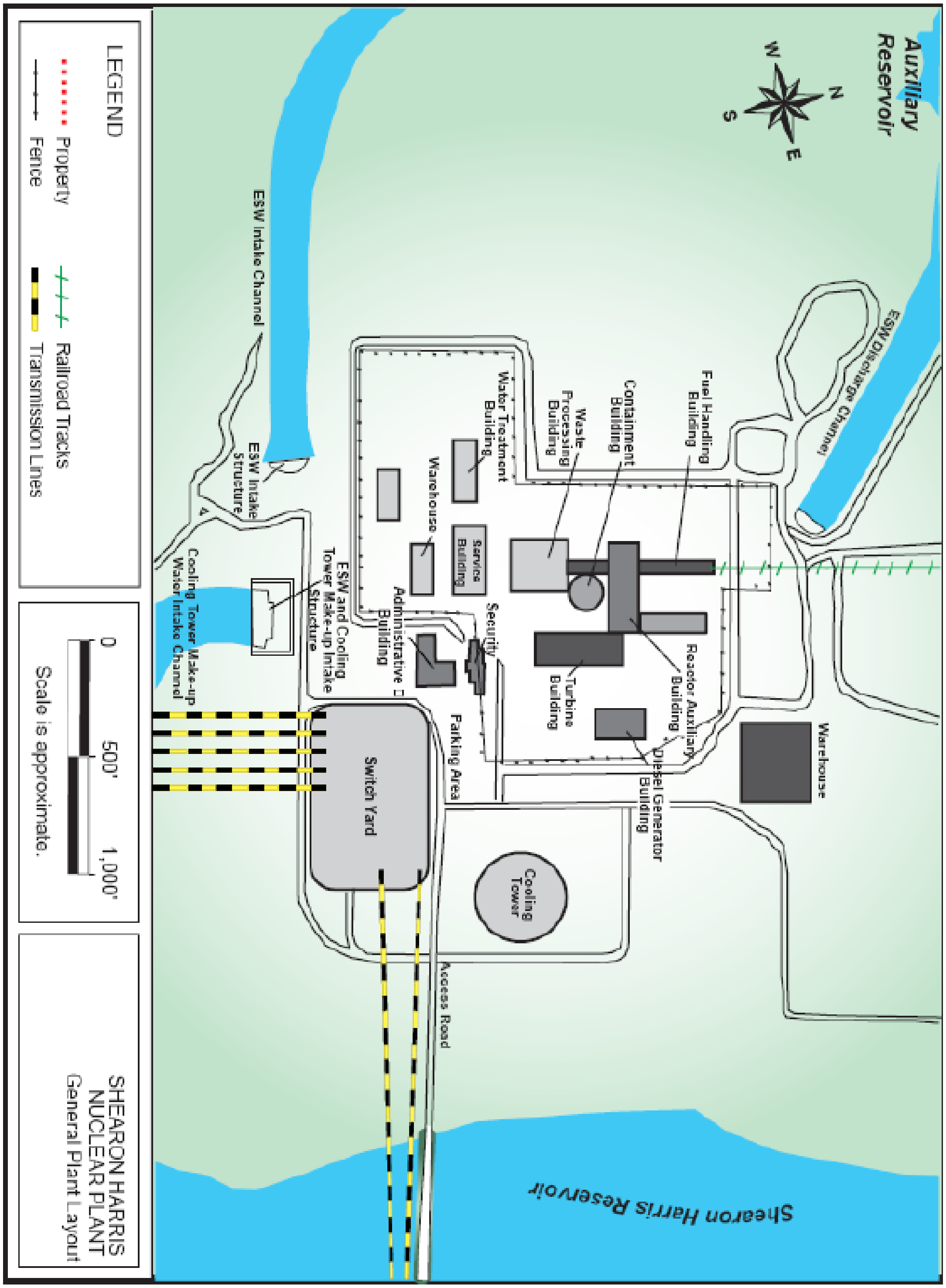
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Fuel Handling Building
Containment Building
Waste Processing Building
Water Treatment Building
Warehouse
Service Building
Security
Administrative Building
ESW and Cooling Tower Make-up Intake Structure
Cooling Tower Make-up Water Intake Channel
ESW Intake Structure
ESW Intake Channel
Turbine Building
Reactor Auxiliary Building
Diesel Generator Building
Warehouse
Parking Area
Switch Yard
Cooling Tower
Access Road
Shearon Harris Reservoir
LEGEND
Property
Fence
Railroad Tracks
Transmission Lines
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500'
1,000'
Scale is approximate.
SHEARON HARRIS NUCLEAR PLANT
General Plant Layout

March 27, 2007

Mr. Sam D. Hamilton, Regional Director
Southeast Region
U.S. Fish & Wildlife Service
1875 Century Blvd., Suite 400
Atlanta, GA 30345

SUBJECT: REQUEST FOR LIST OF PROTECTED SPECIES WITHIN THE AREA UNDER EVALUATION FOR THE SHEARON HARRIS NUCLEAR POWER PLANT LICENSE RENEWAL APPLICATION REVIEW

Dear Mr. Hamilton:

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application submitted by Carolina Power & Light Company (CP&L) doing business as Progress Energy Carolinas Inc., for the renewal of the operating license for Shearon Harris Nuclear Power Plant (HNP). HNP is located in the southwest corner of Wake County, North Carolina. The city of Raleigh, North Carolina, is approximately 16 miles northeast of the plant. As part of the review of the license renewal application (LRA), the NRC is preparing a Supplemental Environmental Impact Statement (SEIS) under the provisions of Title 10 of the *Code of Federal Regulations* Part 51 (10 CFR Part 51), the NRC's regulation that implements the National Environmental Policy Act (NEPA) of 1969. The SEIS includes an analysis of pertinent environmental issues, including endangered or threatened species and impacts to fish and wildlife. This letter is being submitted under the provisions of the Endangered Species Act of 1973, as amended, and the Fish and Wildlife Coordination Act of 1934, as amended.

The proposed action would include the use and continued maintenance of existing plant facilities and transmission lines. The HNP site covers approximately 10,800 acres; of the 10,800 acres that comprise the HNP site, approximately 4,150 acres were inundated with the creation of Harris Reservoir during 1980. Approximately 440 acres are occupied by generating facilities, parking lots, warehouses, equipment storage and laydown areas. Most of the remaining acreage is forested. Upland portions of these forested areas are managed for timber production. Areas along the shore of the Harris Reservoir and buffer zones (i.e., wetlands) are generally in a natural state. HNP is a single-unit plant, nominally rated at 900 megawatts-electrical, with a 523 foot tall cooling tower-based heat dissipation system. The Harris Reservoir serves as the source of cooling tower makeup water.

For the specific purpose of connecting HNP to the transmission system, CP&L has approximately 142 miles of transmission corridor that occupy approximately 1,717 acres. Most corridors pass through land that is primarily agricultural and forest land. The areas are mostly remote, with low population densities. The longer lines cross numerous state and U.S. highways. The transmission line and site boundary are identified in the enclosed maps.

S. Hamilton -2-

To support the SEIS preparation process and to ensure compliance with Section 7 of the Endangered Species Act, the NRC requests information on Federally-listed, proposed, and candidate species and critical habitat that may be in the vicinity of HNP and its associated transmission line rights-of-way. In addition, please provide any information you consider appropriate under the provisions of the Fish and Wildlife Coordination Act.

The NRC staff plans to hold two public NEPA scoping meetings on April 18, 2007, at the New Horizons Fellowship, 820 East Williams St., Apex, North Carolina 27502. The first meeting will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second meeting will convene at 7:00 p.m., with a repeat of the overview portions of the first meeting, and will continue until 10:00 p.m., as necessary. In addition, on June 5, 2007, the NRC plans to conduct an environmental site audit. You and your staff are invited to attend.

If you have any questions concerning the NRC staff's review of this LRA, please contact Mr. Samuel Hernandez, Environmental Project Manager, at 301-415-4049 or via e-mail at shq@nrc.gov.

Sincerely,

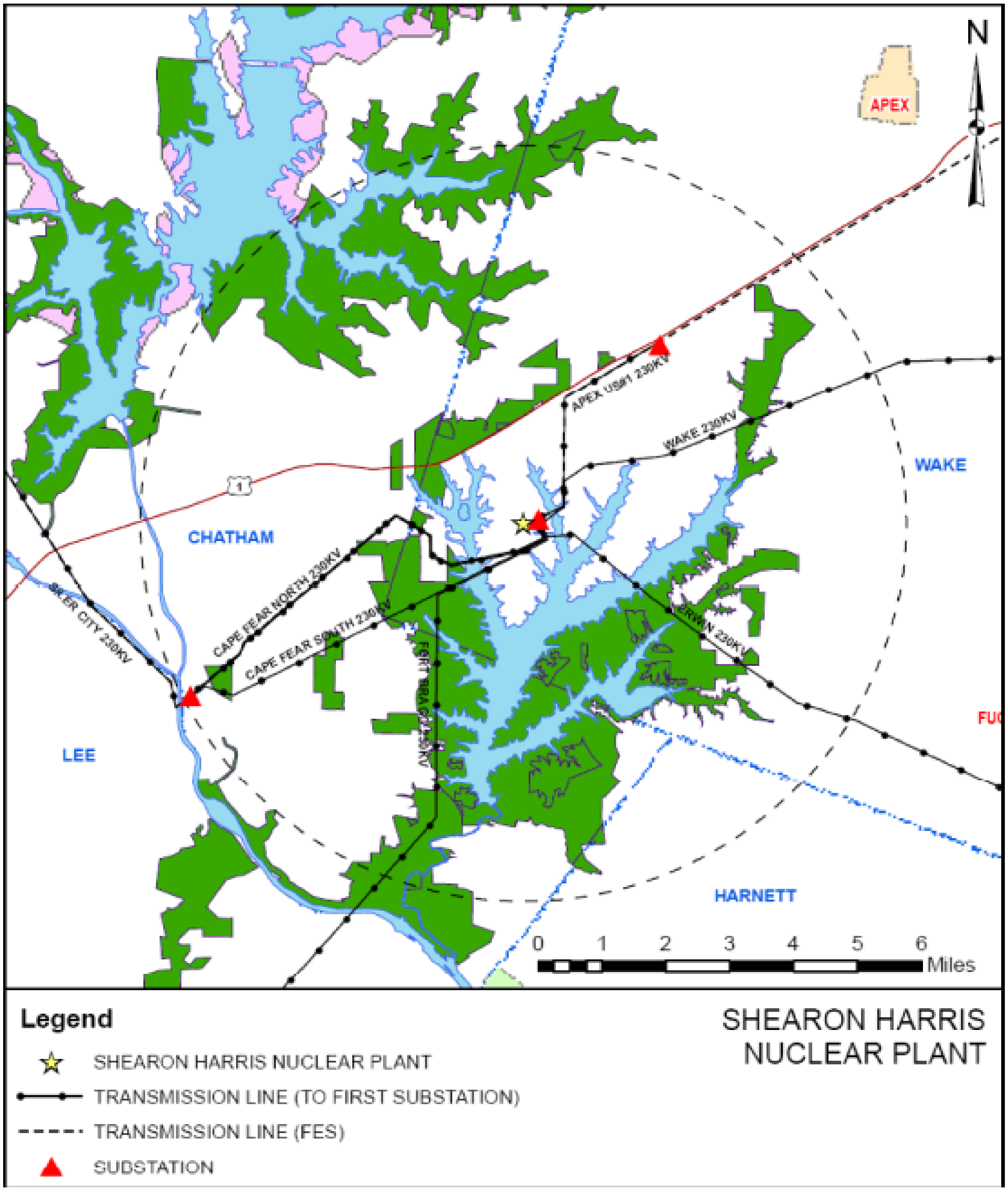
/RA Jennifer A. Davis for/

Rani Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-400

Enclosure:
As stated

cc w/encl: See next page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TRANSMISSION LINE (TO FIRST SUBSTATION)
TRANSMISSION LINE (FES)
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SHEARON HARRIS NUCLEAR PLANT

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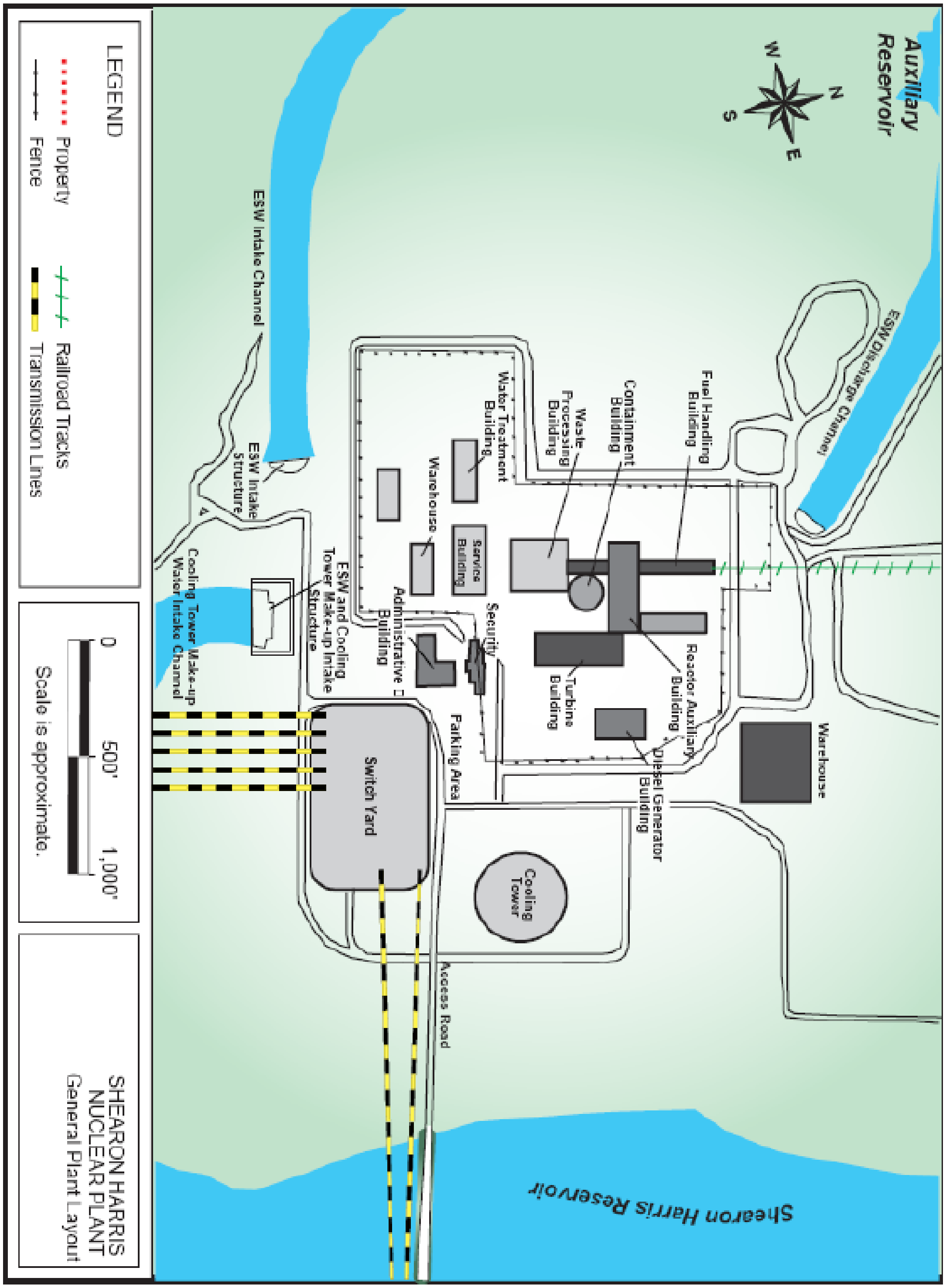

Auxiliary Reservoir
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ESW Discharge Channel
Fuel Handling Building
Containment Building
Waste Processing Building
Water Treatment Building
Warehouse
Service Building
Security
Administrative Building
Reactor Auxiliary Building
Turbine Building
Diesel Generator Building
Warehouse
Parking Area
Switch Yard
Cooling Tower
Access Road
ESW Intake Channel
ESW Intake Structure
ESW and Cooling Tower Make-up Intake Structure
Cooling Tower Make-up Water Intake Channel
Shearon Harris Reservoir
LEGEND
Property
Fence
Railroad Tracks
Transmission Lines
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1,000'
Scale is approximate.
SHEARON HARRIS NUCLEAR PLANT
General Plant Layout

March 27, 2007

Ms. Linda Pearsall, Program Director
North Carolina Natural Heritage Program
1601 Mail Service Center
Raleigh, NC 27699-1601

SUBJECT: REQUEST FOR LIST OF STATE PROTECTED SPECIES WITHIN THE AREA UNDER EVALUATION FOR THE SHEARON HARRIS NUCLEAR POWER PLANT LICENSE RENEWAL APPLICATION REVIEW

Dear Ms. Pearsall:

The U.S. Nuclear Regulatory Commission (NRC) is reviewing an application submitted by Carolina Power & Light Company (CP&L) doing business as Progress Energy Carolinas Inc., for the renewal of the operating license for the Shearon Harris Nuclear Power Plant (HNP). HNP is located in the southwest corner of Wake County, North Carolina. The city of Raleigh, North Carolina, is approximately 16 miles northeast of the plant. As part of the review of the license renewal application (LRA), the NRC is preparing a Supplemental Environmental Impact Statement (SEIS) under the provisions of Title 10 of the *Code of Federal Regulations,* Part 51 (10 CFR Part 51), the NRC's regulation that implements the National Environmental Policy Act (NEPA) of 1969. The SEIS includes an analysis of pertinent environmental issues, including endangered or threatened species and impacts to fish and wildlife.

The proposed action would include the use and continued maintenance of existing plant facilities and transmission lines. The HNP site covers approximately 10,800 acres; of the 10,800 acres that comprise the HNP site, approximately 4,150 acres were inundated with the creation of Harris Reservoir during 1980. Approximately 440 acres are occupied by generating facilities, parking lots, warehouses, equipment storage and laydown areas. Most of the remaining acreage is forested. Upland portions of these forested areas are managed for timber production. Areas along the shore of the Harris Reservoir and buffer zones (i.e., wetlands) are generally in a natural state. HNP is a single-unit plant, nominally rated at 900 megawatts-electrical, with a 523 foot tall cooling tower-based heat dissipation system. The Harris Reservoir serves as the source of cooling tower makeup water.

For the specific purpose of connecting HNP to the transmission system, CP&L has approximately 142 miles of transmission corridor that occupy approximately 1,717 acres. Most corridors pass through land that is primarily agricultural and forest land. The areas are mostly remote, with low population densities. The longer lines cross numerous state and U.S. highways. The transmission line and site boundary are identified in the enclosed maps.

To support the SEIS preparation process, the NRC requests information on state-listed, proposed, candidate species and critical habitat that may be in the vicinity of HNP and its associated transmission line right-of-way. In addition, please provide any information you consider appropriate that might help the NRC to evaluate the impacts that extended operation of HNP for up to an additional 20 years under the terms of a license renewal might impose on state-listed species.

The NRC staff plans to hold two public NEPA scoping meetings on April 18, 2007, at the New Horizons Fellowship, 820 East Williams St., Apex, North Carolina 27502. The first meeting will convene at 1:30 p.m. and will continue until 4:30 p.m., as necessary. The second meeting will convene at 7:00 p.m., with a repeat of the overview portions of the first meeting, and will continue until 10:00 p.m., as necessary. In addition, on June 5, 2007, the NRC plans to conduct an environmental site audit. You and your staff are invited to attend.

If you have any questions concerning the NRC staff's review of this LRA, please contact Mr. Samuel Hernandez, Environmental Project Manager, at 301-415-4049 or via e-mail at shq@nrc.gov.

Sincerely,

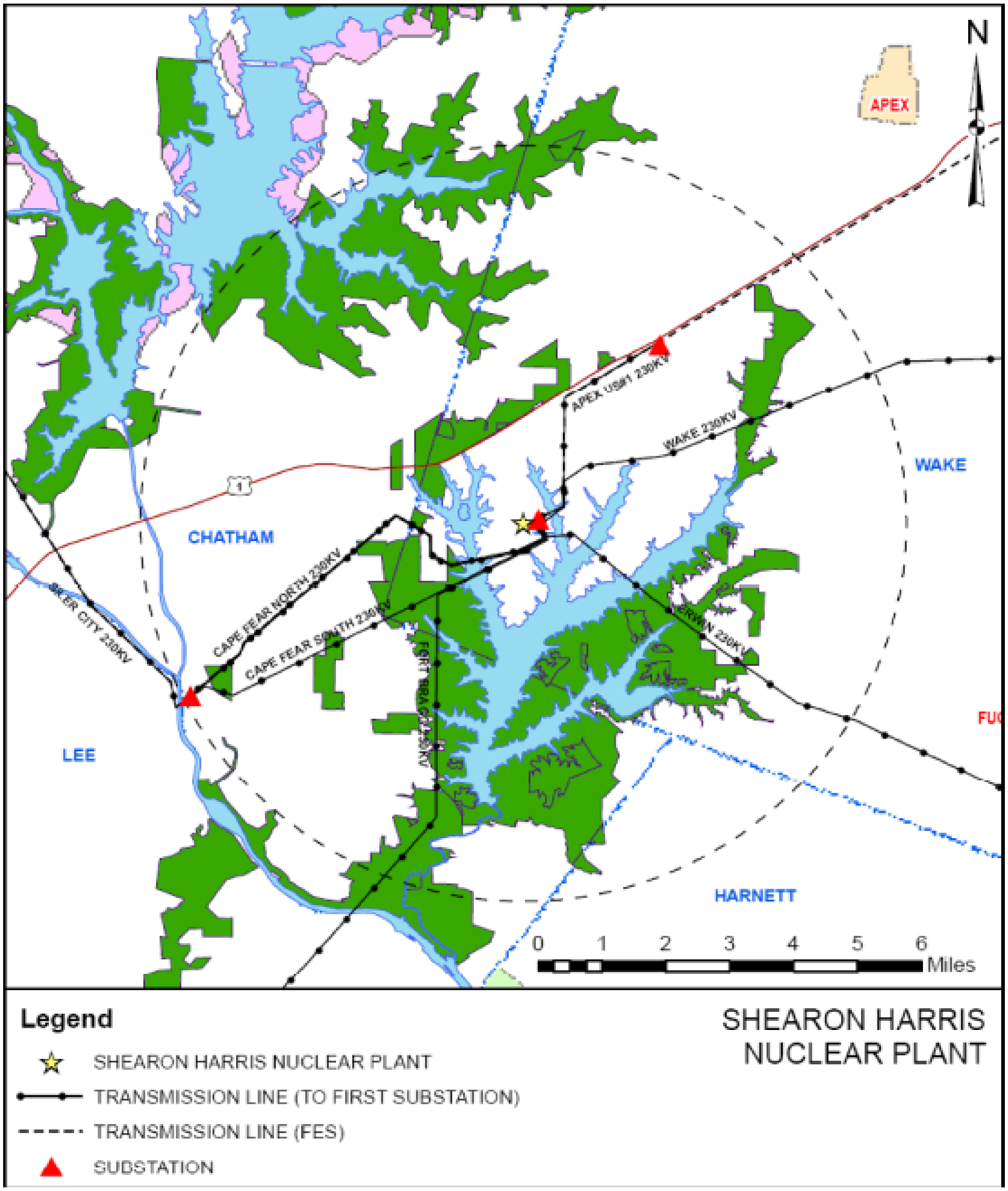
/RA Jennifer A. Davis for/

Rani Franovich, Branch Chief
Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-400

Enclosure:
As stated

cc w/encl: See next page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SHEARON HARRIS NUCLEAR PLANT
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TRANSMISSION LINE (FES)
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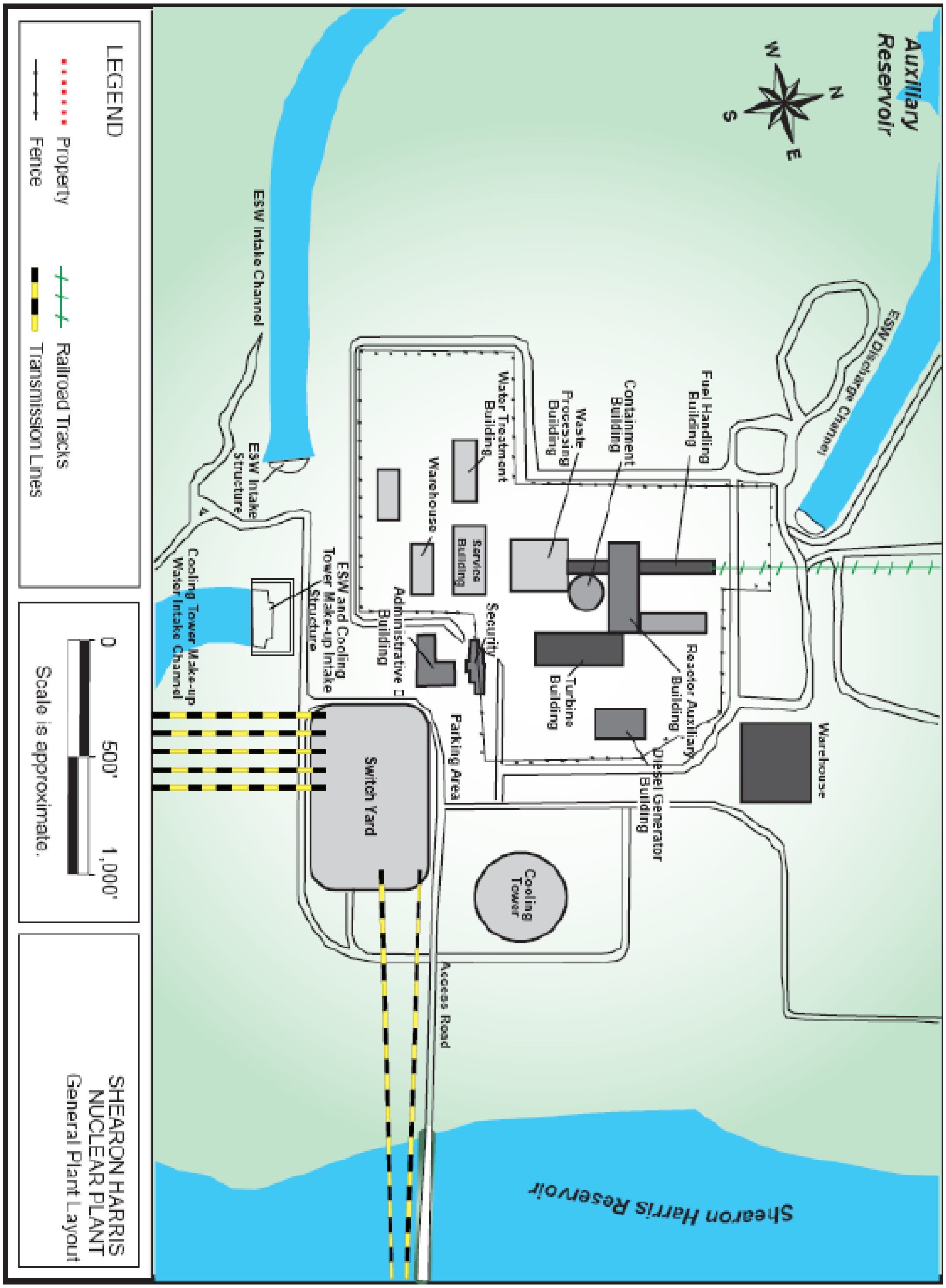
SHEARON HARRIS
NUCLEAR PLANT

ENCLOSURE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ESW Discharge Channel
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Waste Processing Building
Water Treatment Building
Warehouse
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Reactor Auxiliary Building
Turbine Building
Diesel Generator Building
Warehouse
ESW Intake Channel
ESW Intake Structure
ESW and Cooling Tower Make-up Intake Structure
Cooling Tower Make-up Water Intake Channel
Parking Area
Switch Yard
Cooling Tower
Access Road
Shearon Harris Reservoir
LEGEND
Property
Fence
Railroad Tracks
Transmission Lines
0
500'
1,000'
Scale is approximate.
SHEARON HARRIS
NUCLEAR PLANT
General Plant Layout

NCDENR
North Carolina Department of Environment and Natural Resources

Michael F. Easley, Governor

William G. Ross Jr., Secretary

April 26, 2007

Mr. Rani Franovich
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Renewal of Operating License for the Shearon Harris Nuclear Power Plant; Wake and Chatham counties, NC

Dear Mr. Franovich:

The Natural Heritage Program has a number of records of rare species, significant natural communities, or significant natural heritage areas on Progress Energy land at the Shearon Harris plant. The enclosed map shows the locations and names of rare plant and animal species and significant natural communities. I have also enclosed summaries and maps of the natural areas that have been identified by our Program that lie on Progress Energy land. The areas are shaded in gray on the general map.

Nearly all of these natural areas and rare species are located on forested lands, some in pinelands, some on hardwood slopes, and a few in wetlands. Though many rare plants and animals are known to occur in North Carolina within powerline rights-of-ways, apparently no such species are known to occur on the Shearon Harris powerline ROWs.

You may wish to check the Natural Heritage Program database website at www.ncnhp.org for a listing of rare plants and animals and significant natural communities in the county and on the quad map.

NC OneMap now provides digital Natural Heritage data online for free. This service provides site specific information on GIS layers with Natural Heritage Program rare species occurrences and Significant Natural Heritage Areas. The NC OneMap website provides Element Occurrence (EO) ID numbers (instead of species name), and the data user is then encouraged to contact the Natural Heritage Program for detailed information. This service allows the user to quickly and efficiently get site specific NHP data without visiting the NHP workroom or waiting for the Information Request to be answered by NHP staff. For more information about data formats and access, visit <www.nconemap.com/data.html>, or email NC OneMap at <dataq@ncmail.net>.

Please do not hesitate to contact me at 919-715-8697 if you have questions or need further information.

Sincerely,

Harry E. LeGrand, Jr.

Harry E. LeGrand, Jr., Zoologist
Natural Heritage Program

Enclosures

1601 Mail Service Center, Raleigh, North Carolina 27699-1601
Phone: 919-733-4984 \ FAX: 919-715-3060 \ Internet: www.enr.state.nc.us/ENR/

One North Carolina Naturally

Preserving America's Heritage

May 2, 2007

Ms. Rani Franovich
Branch Chief, Environmental Branch B
Division of License Renewal
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

REF: *Notification pursuant to 36 CFR 800.8(c)*
Proposed Shearon Harris Nuclear Power Plant License Renewal
Wake County, North Carolina

Dear Ms. Franovich:

On April 23, 2007, the Advisory Council on Historic Preservation (ACHP) received notification from the Nuclear Regulatory Commission (NRC) pursuant to Section 800.8(c) of the ACHP's regulations, "Protection of Historic Properties" (36 CFR 800). We appreciate receiving your notification, which establishes that NRC will use the process and documentation required for the preparation of a site-specific Supplemental Environmental Impact Statement (SEIS) to comply with Section 106 of the National Historic Preservation Act in lieu of the procedures set forth in 36 CFR 800.3 through 800.6.

In addition to notification to the ACHP, the NRC must also notify the North Carolina State Historic Preservation Officer. In addition, the NRC must meet the standards set forth in Section 800.8(c)(1)(i) through (v) for the following actions required as part of the Section 106 review process:

- Identify consulting parties;
- Involve the public;
- Identify historic properties and assessing the undertaking's effects on historic properties; and
- Consult regarding the effects of the undertaking on historic properties with the SHPO/THPO, Indian tribes and Native Hawaiian organizations that might attach religious and cultural significance to affected historic properties, other consulting parties, and the ACHP, where appropriate, during NEPA scoping, environmental analysis, and the preparation of NEPA documents.

To meet the requirement to consult with the ACHP as appropriate, the NRC should notify the ACHP in the event the NRC determines, in consultation with the SHPO/THPO and other consulting parties, that the proposed undertaking(s) may adversely affect properties listed, or eligible for listing, on the National Register of Historic Places (historic properties). In addition, Section 800.8(c)(2)(i) requires that you submit to the ACHP any SEIS you prepare. Inclusion of your adverse effect determination in both the SEIS and in your cover letter transmitting the SEIS to the ACHP will help ensure a timely response from the ACHP regarding its decision to participate in consultation. Please indicate in your cover letter the schedule for Section 106 consultation and a date by which you require a response by the ACHP. The ACHP's decision to review the SEIS will be based on the applicability of the criteria in Appendix A of the ACHP's regulations.

In the case of an objection from the ACHP or another consulting party, Sections 800.8(c)(2)(ii) and (c)(3) provide for ACHP review of an EIS to determine whether preparation of the EIS has met the standards set forth in Section 800.8(c)(1) and/or to evaluate whether the substantive resolution of the effects on historic properties proposed in an EIS is adequate.

Thank you for your notification pursuant to Section 800.8(c). If you have any questions or if we may be of assistance, please contact Martha Catlin at 202-606-8529 or via e-mail at mcatlin@achp.gov.

Sincerely,

Charlene Dwin Vaughn

Charlene Dwin Vaughn
Assistant Director
Office of Federal Agency Programs

Appendix F

GEIS Environmental Issues Not Applicable to Shearon Harris Nuclear Power Plant, Unit 1

Appendix F: GEIS Environmental Issues Not Applicable to Shearon Harris Nuclear Power Plant, Unit 1

Table F-1 lists those environmental issues identified in the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (GEIS), NUREG-1437, Volumes 1 and 2 (NRC 1996; 1999),[(a)] and Title 10 of the *Code of Federal Regulations*, Part 51 (10 CFR Part 51), Subpart A, Appendix B, Table B-1, that are not applicable to Shearon Harris Nuclear Power Plant, Unit 1 (HNP) because of plant or site characteristics.

Table F-1. GEIS Environmental Issues Not Applicable to Shearon Harris Nuclear Power Plant, Unit 1

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
SURFACE WATER QUALITY, HYDROLOGY, AND USE (FOR ALL PLANTS)			
Altered salinity gradients	1	4.2.1.2.2	The HNP heat-dissipation system does not discharge to an estuary.
Water-use conflicts (plants with once-through cooling systems)	1	4.2.1.3	Once-through cooling system is a feature not applicable at the HNP.
Water-use conflicts (plants with cooling ponds or cooling towers using make-up water from a small river with low flow)	2	4.3.2.1: 4.4.2.1	The HNP cooling system does not use make-up water from a small river with low flow, and the cooling pond heat-dissipation system is not applicable at the HNP.
AQUATIC ECOLOGY (FOR PLANTS WITH ONCE-THROUGH AND COOLING POND HEAT DISSIPATION SYSTEMS)			
Entrainment of fish and shellfish in early life stages for plants with once-through and cooling pond heat dissipation systems	2	4.2.2.1.2	Once-through heat-dissipation systems is a feature not applicable at the HNP.
Impingement of fish and shellfish	2	4.2.2.1.3	Once-through heat-dissipation systems is a feature not applicable at the HNP.
Heat shock	2	4.2.2.1.4	Once-through heat-dissipation systems is a feature not applicable at the HNP.

(a) The GEIS was originally issued in 1996. Addendum 1 to the GEIS was issued in 1999. Hereafter, all references to the "GEIS" include the GEIS and its Addendum 1.

ISSUE—10 CFR Part 51, Subpart A, Appendix B, Table B-1	Category	GEIS Sections	Comment
		GROUNDWATER USE AND QUALITY	
Groundwater use conflicts (potable and service water, and dewatering; plants that use > 100 gpm)	2	4.8.1.1: 4.8.1.2	HNP does not use more than 100 gallons per minute of groundwater.
Groundwater use conflicts (plants using cooling towers withdrawing make-up water from a small river)	2	4.8.1.3	HNP does not withdraw cooling tower make-up water from a small river.
Groundwater-use conflicts (Ranney wells)	2	4.8.1.4	HNP does not have or use Ranney wells.
Groundwater quality degradation (Ranney wells)	1	4.8.2.2	HNP does not have or use Ranney wells.
Groundwater quality degradation (saltwater intrusion)	1	4.8.2.1	The HNP cooling system does not withdraw groundwater from an estuary or an oceanic area.
Groundwater quality degradation (cooling ponds in salt marshes)	1	4.8.3	This issue is related to cooling pond heat-dissipation system which is not applicable at HNP.
Groundwater quality degradation (cooling ponds at inland sites)	2	4.8.3	This issue is related to cooling pond heat-dissipation system which is not applicable at HNP.
		TERRESTRIAL RESOURCES	
Cooling pond impacts on terrestrial resources	1	4.4.4	This issue is related to cooling pond heat-dissipation system which is not applicable at HNP.
		HUMAN HEALTH	
Microbial organisms (public health) (plants using lakes or canals, or cooling towers or cooling ponds that discharge to a small river).	2	4.3.6	The HNP heat-dissipation system does not discharge to a small river.

F.1 References

10 CFR Part 51. *Code of Federal Regulations,* Title 10, *Energy,* Part 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions.”

U.S. Nuclear Regulatory Commission (NRC). 1996. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants*. NUREG-1437, Volumes 1 and 2, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 1999. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Main Report*, *Section 6.3, Transportation, Table 9.1, Summary of findings on NEPA issues for license renewal of nuclear power plants*, *Final Report*. NUREG-1437, Volume 1, Addendum 1, Washington, D.C.

Appendix G

NRC Staff Evaluation of Severe Accident Mitigation Alternatives (SAMAs) for Shearon Harris Nuclear Power Plant, Unit 1

Appendix G

U.S. Nuclear Regulatory Commission Staff Evaluation of Severe Accident Mitigation Alternatives (SAMAs) for Shearon Harris Nuclear Plant in Support of the License Renewal Application Review

G.1 Introduction

Carolina Power and Light Company (CP&L), now doing business as Progress Energy Carolinas, Inc., submitted an assessment of severe accident mitigation alternatives (SAMAs) for Shearon Harris Nuclear Plant (HNP) as part of the environmental report (ER) (Progress Energy 2006). This assessment was based on the most recent HNP probabilistic safety assessment (PSA) available at that time, a plant-specific offsite consequence analysis performed using the MELCOR Accident Consequence Code System 2 (MACCS2) computer code, and insights from the HNP individual plant examination (IPE) (CP&L 1993) and the individual plant examination of external events (IPEEE) (CP&L 1995). In identifying and evaluating potential SAMAs, HNP considered SAMAs that addressed the major contributors to core damage frequency (CDF) and population dose at HNP, as well as SAMA candidates for other operating plants which have submitted license renewal applications. CP&L identified 22 potential SAMA candidates. This list was reduced to 20 unique SAMAs by eliminating SAMAs that are not applicable to the HNP design, or have estimated costs that would exceed the dollar value associated with completely eliminating all severe accident risk at HNP. CP&L assessed the costs and benefits associated with each of the potential SAMAs and concluded in the ER that several of the candidate SAMAs evaluated are potentially cost-beneficial.

Based on a review of the SAMA assessment, the U.S. Nuclear Regulatory Commission (NRC) issued a request for additional information (RAI) to CP&L by letter dated March 27, 2007

(NRC 2007). Key questions concerned: additional details regarding the plant-specific probabilistic safety assessment (PSA) model and changes to the model since the IPE; justification for the multiplier used for external events; the plant-specific reactor core inventory and meteorology data used in the offsite consequence analysis; and further information on several specific candidate SAMAs and low cost alternatives. CP&L submitted additional information by letter dated May 10, 2007 (Progress Energy 2007a). In response to the RAIs, CP&L provided: information regarding PSA models and recent changes; additional justification for the treatment of external events; clarification regarding the reactor core inventory and meteorological data; and additional information regarding several specific SAMAs. CP&L's responses addressed the NRC staff's concerns.

An assessment of SAMAs for HNP is presented below.

G.2 Estimate of Risk for Shearon Harris Nuclear Plant

CP&L's estimates of offsite risk at the HNP are summarized in Section G.2.1. The summary is followed by the NRC staff's review of CP&L's risk estimates in Section G.2.2.

G.2.1 CP&L's Risk Estimates

Two distinct analyses are combined to form the basis for the risk estimates used in the SAMA analysis: (1) the HNP Level 1 and 2 PSA model, which is an updated version of the IPE (CP&L 1993), and (2) a supplemental analysis of offsite consequences and economic impacts (essentially a Level 3 PSA model) developed specifically for the SAMA analysis. The SAMA analysis is based on the most recent HNP Level 1 and 2 PSA model available at the time of the ER, referred to as the Model of Record 2005 (i.e., the MOR2005 model). The scope of the HNP PSA does not include external events.

The baseline CDF for the purpose of the SAMA evaluation is approximately 9.24 x 10-6 per year. The CDF is based on the risk assessment for internally-initiated events, which includes internal flooding. CP&L did not include the contribution from external events within the HNP risk estimates; however, it did account for the potential risk reduction benefits associated with external events by doubling the estimated benefits for internal events. This is discussed further in Sections G.2.2 and G.6.2.

The breakdown of CDF by initiating event is provided in Table G-1. As shown in this table, events initiated by loss of offsite power (LOOP) and internal flooding are the dominant contributors to CDF. Although not separately reported, station blackout (SBO) sequences contribute roughly 2.2 x 10-6 per year (24 percent of the total internal events CDF), while anticipated transient without scram (ATWS) sequences contribute 2.3 x 10-7 per year (about 2 percent of the total internal events CDF).

The current Level 2 HNP PSA is based on the IPE model with updates to reflect changes to the plant due to a 4.5 percent power uprate and steam generator replacement, and minor changes to some inputs. The model utilizes a Containment Safeguards Event Tree (CSET) and a Containment Event Tree (CET) that address both systemic and phenomenological events. The significant Level 1 core damage sequences were processed using the CSET to determine the applicable endstates and their frequencies. The CSET derived endstates were used as input into the CET in order to determine the containment response. The CET has 14 possible endstates which provide information about accident sequence progression, containment status, and source term release. The frequency of each release category was obtained by summing the frequency of the individual accident progression CET endpoints into the release category. The release characteristics for the release categories are based on updated Modular Accident

Analysis Program (MAAP) analyses that reflect the revised HNP configuration (Progress Energy 2007a).

Table G-1. HNP Core Damage Frequency

Initiating Event	**CDF (Per Year)**	**% Contribution to CDF**
Loss of Offsite Power	2.8×10^{-6}	30
Internal Floods	1.6×10^{-6}	17
LOCA	1.3×10^{-6}	14
Loss of AC Bus	9.2×10^{-7}	10
Steam Generator Tube Rupture	8.3×10^{-7}	9
Reactor Trip	4.6×10^{-7}	5
Loss of Feedwater	4.6×10^{-7}	5
Loss of Instrument Air	3.7×10^{-7}	4
Spurious ESFAS	2.8×10^{-7}	3
Interfacing System LOCA	1.9×10^{-7}	2
Other	9.2×10^{-8}	1
Total CDF (internal events)	**9.24×10^{-6}**	**100**

The offsite consequences and economic impact analyses use the MACCS2 code to determine the offsite risk impacts on the surrounding environment and public. Inputs for these analyses include plant-specific and site-specific input values for core radionuclide inventory, source term and release characteristics, site meteorological data, projected population distribution (within an 80-kilometer (50-mile) radius) for the year 2040, emergency response evacuation modeling, and economic data. The magnitude of the onsite impacts (in terms of clean-up and decontamination costs and occupational dose) is based on information provided in NUREG/BR-0184 (NRC 1997a).

In the ER, CP&L estimated the dose to the population within 80 kilometers (50 miles) of the HNP site to be approximately 0.290 person-sievert (Sv) (29.0 person-rem) per year. The breakdown of the total population dose by containment release mode is summarized in Table G-2. Containment bypass failures such as a steam generator tube rupture (SGTR) accident with a stuck open safety relief valve (SRV) on the ruptured steam generator or an unmitigated interfacing-systems loss of coolant accident (ISLOCA) dominate the contributions to the population dose risk at HNP.

Table G-2. Breakdown of Population Dose by Containment Release Mode

Containment Release Mode	Population Dose (Person-Rem[1] Per Year)	% Contribution
Containment Intact	0	0
Late Containment Failure without scrubbing	0.9	3
Large Early Containment Failure without scrubbing	0.1	0
Small Containment Bypass (SGTR or mitigated inter-system LOCA) with scrubbing	0.4	1
Large Containment Bypass (SGTR with stuck open SRV, ruptured SG or unmitigated ISLOCA) with scrubbing	5.4	19
Large Containment Bypass (SGTR with stuck open SRV, ruptured SG or unmitigated ISLOCA) without scrubbing	19.9	69
Very Late Containment Failure (basemat melt through)	0.2	1
Very Late Containment Failure (over pressurization)	1.9	7
Total	**29**	**100**

[1]One person-Rem = 0.01 person-Sv

G.2.2 Review of CP&L's Risk Estimates

CP&L's determination of offsite risk at HNP is based on the following three major elements of analysis:

- The Level 1 and Level 2 risk models that form the bases for the 1993 IPE submittal (CP&L 1993), and the external events analyses of the 1995 IPEEE submittal (CP&L 1995),

- The major modifications to the IPE model that have been incorporated in the HNP 2005 PSA Update, and

- The MACCS2 analyses performed to translate fission product source terms and release frequencies from the Level 2 PSA model into offsite consequence measures.

Each of these analyses was reviewed to determine the acceptability of CP&L's risk estimates for the SAMA analysis, as summarized below.

The NRC staff's review of the HNP IPE is described in an NRC report dated January 26, 1996 (NRC 1996). Based on a review of the IPE submittal and responses to RAIs, the NRC staff concluded that the IPE submittal met the intent of Generic Letter (GL) 88-20; that is, the licensee's IPE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities. The IPE did not identify any severe accident vulnerabilities associated with either core damage or poor containment performance.

Although no vulnerabilities were identified in the IPE, several improvements to the plant or procedures were identified. These improvements have been either implemented at the site, or addressed by a SAMA in the current evaluation (Progress Energy 2006).

There have been six revisions to the IPE model since the 1993 IPE submittal. A comparison of the internal events CDF between the updated 1993 IPE submittal and the current PSA model (MOR2005) indicates a decrease of approximately 87 percent (from 7×10^{-5} per year to 9.24×10^{-6} per year), with most of the reduction occurring in the 2003 and 2005 updates. A description of those changes that resulted in the greatest impact on the internal events CDF was provided in Section E.2 of the ER, and is summarized in Table G-3.

1 **Table G-3**. HNP PSA Historical Summary

PSA Version	Summary of Changes from Prior Model	CDF (per year)
1993	IPE Submittal (Internal Flooding Contribution 5 x 10^{-6})	7.0 x 10^{-5}
MOR1995	1995 PSA Update - Added CSIP pump alternate minimum flow lines - Installed rotary instrument air compressor - Installed isolation valves in the RHR pump recirculation lines to the RWST - Added the requirement for the operation of one-of-three pressurizer PORVs for the bleed function of feed and bleed cooling for small LOCAs, seal LOCAs and unisolated SGTR - Added several system and initiating event fault tree models - Updated initiating event frequencies, LOOP recovery probabilities, and plant specific reliability and availability data - Re-assessed operator actions to provide more realistic human error probabilitieis (HEPs), improve consistency, and remove conservatisms	6.2 x 10^{-5}
MOR1998	1998 PSA Update - Removed credit for refilling the RWST following a failure of recirculation for S1 LOCAs and transient induced LOCAs - Added credit to TQ LOCA and S1 LOCA event tree logic to take credit for rapid cooldown and depressurization - Updated the S1 LOCA and TQ LOCA event trees with a new gate that allowed for RHR operation without CCW cooling - Implemented rule based recovery of offsite power - Added turbine trip initiating as input to the loss of condenser cooling - Updated transient initiating event categories without plant-specific initiating event system models	5.0 x 10^{-5}

PSA Version	Summary of Changes from Prior Model	CDF (per year)
MOR2000	2000 PSA Update - Revised the instrument air fault tree model and support systems to reflect the replacement of the four reciprocating instrument air compressors with two rotary air compressors - Added a new Loss of Instrument Air initiating event fault tree to replace the single point estimate basic event - Revised the demineralized water system model to capture procedural changes requiring the normal position of the RWST supply valve to be normally closed - Revised operator actions as part of the procedure reviews to improve overall consistency and documentation quality	5.0×10^{-5}
MOR2001	2001 PSA Update - Incorporated changes to reflect the SG replacement and power uprate modifications - Removed credit for RWST makeup from SGTR sequences that included a loss of secondary side heat removal - Revised plant specific ISLOCA initiating event tree to include operator intervention for smaller break sizes - Expanded common-cause failure analysis in the CCW initiating event tree to include the swing pump credit - Updated transient and SGTR initiating event frequencies, LOOP recovery probabilities, and plant specific reliability and availability data	4.9×10^{-5}

PSA Version	Summary of Changes from Prior Model	CDF (per year)
MOR2003	2003 PSA Update - Implemented the Rhodes seal LOCA model to replace the NUREG/CR-4550 model - Incorporated the most recent Westinghouse guidance on modeling SGTR and ATWS sequences - Added the potential for containment sump clogging - Updated common-cause analysis - Updated ISLOCA analysis - Added credit for local operation of TDAFW pump when B Train DC power is unavailable based on plant procedures - Updated transient initiating event frequencies, LOOP recovery probabilities, and plant specific reliability and availability data	2.5×10^{-5}
MOR2005	2005 PSA Update - Updated human reliability analysis - Updated the LOSP recovery analysis to reflect the change to the WOG2000 Seal LOCA model - Updated the internal flooding analysis - Removed credit for cool-down/depressurization with secondary side heat removal going on shutdown cooling with no LPI/HHSI - Updated common-cause failure events in accordance with NUREG/CR-5497 - Updated data for several valves to reflect demand failure rates	9.2×10^{-6}

The CDF value from the 1993 HNP IPE submittal (7.0×10^{-5} per year) is at the low end of the range of the CDF values reported in the IPEs for Westinghouse three-loop plants. Figure 11.6 of NUREG-1560 shows that the IPE-based total internal events CDF for three-loop Westinghouse plants ranges from 7×10^{-5} per year to 4×10^{-4} per year (NRC 1997b). It is recognized that other plants have updated the values for CDF subsequent to the IPE submittals to reflect modeling and hardware changes. The current internal events CDF result for HNP (9.24×10^{-6} per year) is lower than that for other plants of similar vintage and characteristics.

The NRC staff considered the peer reviews performed for the HNP PSA, and the potential impact of the review findings on the SAMA evaluation. In the ER and in response to an NRC staff RAI (Progress Energy 2007a), CP&L described the peer review by the Westinghouse Owner's Group (WOG) of the 2001 PSA Model conducted in June 2002. The peer review identified two Level A and 27 Level B Facts & Observations (F&Os) (Progress Energy 2007). CP&L states that all Level A F&Os (important and necessary to address before the next regular PSA update) and Level B F&Os (important and necessary to address but disposition may be deferred until the next PSA update) have been dispositioned, and that those requiring model and/or documentation changes have been addressed with the issuance of MOR2005 (Progress Energy 2006 and 2007a).

Given that the HNP internal events PSA model has been peer-reviewed and the peer review findings were all addressed, and that CP&L has satisfactorily addressed NRC staff questions regarding the PSA, the NRC staff concludes that the internal events Level 1 PSA model is of sufficient quality to support the SAMA evaluation.

As indicated above, the current HNP PSA does not include external events. In the absence of such an analysis, CP&L used the HNP IPEEE to identify the highest risk accident sequences and the potential means of reducing the risk posed by those sequences, as discussed below.

The HNP IPEEE was submitted in June 1995 (CP&L 1995), in response to Supplement 4 of Generic Letter 88-20 (NRC 1991). This submittal included a seismic margins analysis, a fire PSA, and a screening analysis for other external events. While no fundamental weaknesses or vulnerabilities to severe accident risk in regard to the external events were identified, several opportunities for seismic and fire risk reduction were identified as discussed below. In a letter dated January 14, 2000, the NRC staff concluded that the submittal met the intent of Supplement 4 to Generic Letter 88-20, and that the licensee's IPEEE process is capable of identifying the most likely severe accidents and severe accident vulnerabilities (NRC 2000).

The HNP IPEEE used a focused scope Electric Power Research Institute (EPRI) seismic margins analysis. This method is qualitative and does not provide numerical estimates of the CDF contributions from seismic initiators (EPRI 1991). For this assessment, a detailed walkdown was performed in which components were screened using an overall high confidence of low probability of failure (HCLPF) capacity of 0.3g, the review level earthquake (RLE) value for the plant, and the screening level that would be used for a focused-scope plant. The ER states that not all of the Safe Shutdown Equipment in the plant was initially determined to meet the HCLPF requirements for the 0.30g peak ground acceleration (pga) Review Level Earthquake (RLE). Following additional evaluation by CP&L, most of the remaining equipment was found to meet the HCLPF capacity of 0.3g and the few remaining components are addressed by a candidate SAMA that evaluates increasing their seismic capacity.

The HNP IPEEE fire analysis employed a combination of probabilistic risk analysis with Electric Power Research Institute's fire-induced vulnerability evaluation (FIVE) methodology. The evaluation was performed in four phases: (1) qualitative screening, (2) quantitative screening, (3) fire damage evaluation screening, and (4) fire scenario evaluation and quantification. Each phase focused on those fire areas that did not screen out in the prior phases. The final phase involved using the IPE model for internal events to quantify the CDF resulting from a fire-initiating event. The CDF for each area was obtained by multiplying the frequency of a fire in a given fire area by the conditional core damage probability associated with that fire area including, where appropriate, the impact of fire suppression and fire propagation. In most cases, it was assumed that all equipment in the area was damaged by the fire. The potential impact on containment performance and isolation was evaluated following the core damage evaluation. In response to an RAI on some potential weaknesses noted in the staff's evaluation of the IPEEE fire analysis, CP&L provided supporting documentation that addressed concerns associated with the screening of fire areas, and the control room and cable spreading room fire ignition frequencies (Progress Energy 2007a).

The total fire CDF from the IPEEE was estimated to be 1.1 x 10^{-5} per year (CP&L 1995). The dominant fire areas and their contributions to the fire CDF are listed in Table G-4.

Table G-4. Fire Areas and their Contribution to Fire CDF

Fire Area	Major Equipment Failed	CDF (per year)
1-A-SWGRB/1	1B-SB AC Emergency Bus (plus other minor contributors)	1.1E-06
1A-SWGRB/2	Entire “B” division safe shutdown path, offsite power to 1ASA without successful operator action.	2.8E-06
1-A-SWGRA/FDS ASG1	1A-SA AC Emergency Bus (plus other minor contributors)	4.4E-07
1-A-SWGRA/FDS ASG2	Entire “A” division safe shutdown path	2.6E-06
1-A-SWGRA/FDS ASG3	1A-SA AC Emergency Bus (plus other minor contributors), fire induced spurious open PORV	7.6E-08
12-A-CR/1D1	AFW SA/SB, CWS SA, EDG SB, ESW SA/SB, HCRC SB, HCRM SB, HDGB SB, RCSPC SB	1.3E-06
12-A-CR/6B	No SSE damaged, but main control room evacuation and shutdown from the alternate control panel (ACP) are required.	3.0E-06
Total Fire CDF		**1.1 x 10^{-5}**

In the ER, CP&L states that the use of the fire analysis results as a reflection of CDF may be inappropriate and that while the fire PSA is generally self-consistent within its calculational framework, the fire analysis does not compare well with internal events PSAs because of the number of conservative assumptions that have been included in the fire analysis process. The ER provides a list of fire analysis topics (involving technical inputs, data and modeling) that prevent the effective comparison of the CDF between the internal events PSA and the fire analysis. In response to an RAI requesting the applicability of the general topics to the HNP fire analysis (NRC 2007), CP&L provided several HNP-specific examples of conservatisms in the fire analysis, including: a factor of 6.5 reduction in the internal events CDF since the IPE that has not been incorporated into the fire CDF, potential reduction in fire ignition frequencies, conservative target fire damage assumptions, and conservative application of generic COMPBRN results (Progress Energy 2007a). Although arguments regarding the conservatisms in the fire analysis are presented in the ER and RAI responses, CP&L used the baseline fire CDF of 1.1 x 10^{-5} per year in the SAMA analysis rather than some reduced value.

The IPEEE analysis of high winds, floods, and other external events followed the screening and evaluation approaches specified in NUREG/CR-4839 (NRC 1992) and did not identify any significant sequences or vulnerabilities (CP&L 1995). Based on this result, CP&L concluded that these other external hazards would not be expected to impact the conclusions of the SAMA analysis and did not consider specific SAMAs for these events. It is noted that the risks from deliberate aircraft impacts were explicitly excluded since this was being considered in other forums along with other sources of sabotage.

Based on the aforementioned results, the external events CDF is approximately 1.4 times the internal events CDF (based on a fire CDF of 1.1×10^{-5} per year, a combined CDF from seismic, high wind, external flood, and transportation events CDF of 2×10^{-6} per year, and an internal events CDF of 9.24×10^{-6} per year). Accordingly, the total CDF from internal and external events would be approximately 2.4 times the internal events CDF. In the SAMA analysis submitted in the ER, CP&L doubled the benefit that was derived from the internal events model to account for the combined contribution from internal and external events. This doubling was not applied to the SAMA that specifically addresses seismic risk or to the fire risk portion of the two SAMAs where the impact on fire risk is determined separately. For the seismic SAMA, only the seismic benefit is estimated. For fire risk portion of the two fire related SAMAs, the fire benefit was explicitly calculated using an estimate derived from the IPEEE and a correlation between internal and external events. Doubling the benefit for these SAMAs is not appropriate since these SAMAs are specific to external events or, as in the case for the two fire-related SAMAs, have a targeted external event impact and would be underestimated if calculated using the doubling approach. In response to an RAI requesting justification for increasing the internal events CDF by only a factor of 2, CP&L provided arguments related to the conservative bias and modeling limitations of the fire analysis, and results of a sensitivity analysis that showed the outcome of the SAMA analysis is unchanged when the multiplier is increased from 2.0 to 2.4 (Progress Energy 2007a). The NRC staff agrees with the licensee's overall conclusion concerning the impact of external events and concludes that the licensee's use of a multiplier of 2.0 to account for external events is reasonable for the purposes of the SAMA evaluation.

The NRC staff reviewed the general process used by CP&L to translate the results of the Level 1 PSA into containment releases, as well as the results of the Level 2 analysis, as described in the ER and in response to NRC staff requests for additional information (Progress Energy 2007a). The current Level 2 HNP PSA is based on the IPE model with updates to reflect changes to the plant due to a 4.5 percent power uprate and steam generator replacement, and minor changes to some inputs. The model utilizes a Containment Safeguards Event Tree (CSET) and a Containment Event Tree (CET) that address both systemic and phenomenological events. The significant Level 1 core damage sequences were processed using the CSET to determine the applicable endstates and their frequencies. The CSET derived endstates were used as input into the CET in order to determine the containment response. CP&L characterized the releases for the spectrum of possible radionuclide release scenarios using a set of 14 release categories, defined based on the timing and magnitude of the release and whether the containment remains intact or is bypassed. The frequency of each release category was obtained by summing the frequency of the individual accident progression CET endpoints into the release category. Source term release characteristics were developed for each release category based on results of plant-specific calculations using the Modular

Accident Analysis Program (MAAP 3.0B) computer program. The release categories and their frequencies and release characteristics are presented in Table E.3-2 of the ER. All releases were modeled as occurring at ground level with an assumed thermal content of 1.0E+07 watts. CP&L assessed the impact of alternatively assuming an elevated release at a release height of 66 meters (top of the plant stack). The results of these sensitivity studies showed that the elevated release produces about a 16 percent and 12 percent increase in population dose and the offsite economic cost risk, respectively (Progress Energy 2006). CP&L stated in the ER that using a ground level release is more realistic, given that the largest contributors to the release consequences are SGTR and ISLOCA events, which do not release through the plant stack.

The NRC staff's review of the Level 2 IPE concluded that it addressed the most important severe accident phenomena normally associated with large, dry containments, and identified no significant problems or errors (NRC 1996). In response to an RAI on the changes to the Level 2 analysis since the IPE, CP&L stated that the MAAP input deck was updated to reflect the power uprate and steam generator replacement, and confirmatory analyses were made to ensure that existing Level 2 analyses were consistent with the revised plant configuration. However, the methodology and approach used in the Level 2 PSA continues to be based on the IPE model. Based on the NRC staff's review of the Level 2 methodology and the fact that the Level 2 model was reviewed in more detail as part of the WOG peer review, the NRC staff concludes that the Level 2 PSA provides an acceptable basis for evaluating the benefits associated with various SAMAs.

As indicated in the ER, the reactor core radionuclide inventory used in the consequence analysis was derived from the plant's safety analysis Table 15.0.9-1. In response to a request for additional information, the licensee indicated that the current HNP Capital Long Range Plan does not contain any projects that would substantially impact the plant-specific fuel burnup / management as the plant is expected to be operated during the renewal period (including power uprate). However, an Appendix K power uprate is planned that would cause only a 2 percent increase in core fission product inventory.

The NRC staff reviewed the process used by CP&L to extend the containment performance (Level 2) portion of the PSA to an assessment of offsite consequences (essentially a Level 3 PSA). This included consideration of the source terms used to characterize fission product releases for the applicable containment release categories and the major input assumptions used in the offsite consequence analyses. The MACCS2 code was utilized to estimate offsite consequences. Plant-specific input to the code includes the source terms for each release category and the reactor core radionuclide inventory (both discussed above), site-specific meteorological data, projected population distribution within an 80-kilometer (50-mile) radius for the year 2040, emergency evacuation modeling, and economic data. This information is provided in Attachment E of the ER.

CP&L used site-specific meteorological data for the 2003 calendar year as input to the MACCS2 code. The development of the meteorological data is discussed in Section E.3.5 of the ER and in response to an RAI (Progress Energy 2007a). The data were collected from the meteorological tower located 1.1 miles northeast of the reactor complex, with the base of the tower at approximately the plant grade level of 260 ft above main sea level. Data from 2001 through 2005 were also considered, but the 2003 data was chosen because results of a MACCS2 sensitivity case comparing the use of 2001 to 2004 data indicated that the 2003 data produced more conservative results, i.e., about a 5 percent increase in economic cost risk over the 2005 data (Progress Energy 2007c). For instances where data were missing for brief periods or were invalid, the data were developed based on either interpolation or substitution using other onsite instruments or data from a nearby National Weather Service (NWS) or Federal Aviation Administration (FAA) observation location, or from the Raleigh-Durham airport (RDU) data. For longer stability data loss periods, RDU wind direction, cloud cover and ceiling height are used in conjunction with the time of day and time of year to derive a stability class. Hourly radar-derived precipitation estimates were used to confirm that hourly values from RDU are consistent at HNP or were adjusted according to the radar results (Progress Energy 2007a). The NRC staff concludes that the use of the 2003 meteorological data in the SAMA analysis is reasonable.

The population distribution the licensee used as input to the MACCS2 analysis was estimated for the year 2040, based on the U.S. Census Bureau population data for 2000, as provided by the SECPOP 2000 program (NRC 2003), the 2000 county-level census data (USCB 2000) and state projections for the year 2030 (State of North Carolina 2005). The 2040 population was adjusted to account for transient population. The 2000 and 2030 census data were used to estimate the annual population growth rate. It was assumed that the growth rate would remain the same as the average rate projected between 2000 and 2030. The growth rate was derived assuming an exponential growth. Using sector-specific population growth rates, projections were made by extrapolating the 2030 sector population data to year 2040. A population sensitivity case was performed by using a 30 percent uniform increase in population for all sectors. The 30 percent population case showed about a 33 percent change in both population dose and offsite economic cost risk. The NRC staff considers the methods and assumptions for estimating population reasonable and acceptable for purposes of the SAMA evaluation.

The emergency evacuation model was modeled as a single evacuation zone extending out 16 kilometers (10 miles) from the plant. It was assumed that 95 percent of the population would move at an average speed of approximately 1.2 meters per second with a delayed start time of 15 minutes (Progress Energy 2006). This assumption is conservative relative to the NUREG-1150 study (NRC 1990), which assumed evacuation of 99.5 percent of the population within the emergency planning zone. A sensitivity analysis was performed in which the evacuation speed was decreased by 50 percent. The result was a 24 percent increase in the total population dose (Progress Energy 2007c). The NRC staff concludes that the evacuation assumptions and analysis are reasonable and acceptable for the purposes of the SAMA evaluation.

Much of the site-specific economic data was provided from SECPOP2000 (NRC 2003) by specifying the data for each of the counties surrounding the plant to a distance of 50 miles. SECPOP2000 utilizes economic data from the 1997 Census of Agriculture (USDA 1998). In addition, generic economic data that applied to the region as a whole were revised from the

MACCS2 sample problem input when better information was available. Some of this data was adjusted using the consumer price index of 1.68. These revised parameters included the value of farm and non-farm wealth.

Subsequent to the ER, several input/output problems related to use of the SECPOP2000 code were identified. CP&L performed a re-analysis of the benefit estimates using corrected input/output, and found that the overall results of the SAMA assessment were not affected. This is discussed further in Section G.6.1.

The NRC staff concludes that the methodology used by CP&L to estimate the offsite consequences for HNP provides an acceptable basis from which to proceed with an assessment of risk reduction potential for candidate SAMAs. Accordingly, the NRC staff based its assessment of offsite risk on the CDF and offsite doses reported by CP&L.

G.3 Potential Plant Improvements

The process for identifying potential plant improvements, an evaluation of that process, and the improvements evaluated in detail by CP&L are discussed in this section.

G.3.1 Process for Identifying Potential Plant Improvements

CP&L's process for identifying potential plant improvements (SAMAs) consisted of the following elements:

- Review of the most significant basic events from the current plant-specific PSA,
- Review of potential plant improvements identified in the HNP IPE and IPEEE,
- Review of dominant fire areas from the fire analysis that could potentially reduce the associated fire risk,
- Review of Phase II SAMAs from license renewal applications for six other U.S. nuclear sites, and
- Review of other industry documentation discussing potential plant improvements.

Based on this process, an initial set of 22 potential SAMA candidates, referred to as Phase I SAMAs, was identified. In Phase I of the evaluation, CP&L performed a qualitative screening of the initial list of SAMAs and eliminated SAMAs from further consideration using the following criteria:

- The SAMA is not applicable at HNP due to design differences, or

- The SAMA has estimated costs that would exceed the dollar value associated with completely eliminating all severe accident risk at HNP.

Based on this screening, 2 SAMAs were eliminated leaving 20 unique SAMAs for further evaluation. The remaining SAMAs, referred to as Phase II SAMAs, are listed in Table E.5-4 of the ER (Progress Energy 2006). In Phase II, a detailed evaluation was performed for each of the 20 remaining SAMA candidates, as discussed in Sections G.4 and G.6 below. To account for the potential impact of external events, the estimated benefits based on internal events were multiplied by a factor of 2 except for those SAMAs specific to external events, since those SAMAs address specific portions of the fire and seismic fire risk (in these cases, a separate evaluation is used).

G.3.2 Review of CP&L's Process

CP&L's efforts to identify potential SAMAs focused primarily on areas associated with internal initiating events, but also included explicit consideration of potential SAMAs for fire and seismic events. The initial list of SAMAs generally addressed the accident sequences considered to be important to CDF from functional, initiating event, and risk reduction worth perspectives at HNP, and included selected SAMAs from prior SAMA analyses for other plants.

CP&L provided a tabular listing of the PSA basic events sorted according to their risk reduction worth (RRW) (Progress Energy 2006). SAMAs impacting these basic events would have the greatest potential for reducing risk. CP&L used a RRW cutoff of 1.014, which corresponds to about a 1.4-percent change in CDF given 100-percent reliability of the SAMA. This equates to a benefit of approximately $48,500 (after the benefits have been multiplied to account for external events). In response to an RAI, CP&L indicated that they had misinterpreted the function of the PSA human action failure event "OPER-66 - Failure to locally operate the turbine-driven pump after power failure" in the ER and that risk reduction opportunities related to OPER-66 could have been missed in the SAMA identification process (Progress Energy 2007b). In their response, CP&L demonstrated that the majority of OPER-66 risk is addressed by cost-beneficial SAMA 8, therefore minimizing the impact of this error.

CP&L also provided and reviewed the LERF-based RRW events down to an RRW of 1.014. CP&L correlated the basic events with highest risk importance in the Level 1 and 2 PSA with the SAMAs evaluated in Phase I or Phase II, and showed that, with a few exceptions, all of the significant basic events are addressed by one or more SAMAs (Progress Energy 2006). Of the basic events of high risk importance that are not addressed by SAMAs, each is closely tied to other basic events that had been addressed by one or more SAMAs.

For a number of the Phase II SAMAs listed in the ER, the information provided did not sufficiently describe the proposed modification. Therefore, the NRC staff asked the licensee to provide more detailed descriptions of the modifications for several of the Phase II SAMA candidates (NRC 2007). In response to the RAI (Progress Energy 2007b), CP&L provided more detailed information on the modifications for SAMAs 2, 4 and 8.

The NRC staff questioned CP&L about lower cost alternatives to some of the SAMAs evaluated (NRC 2007), including:

- Changes to procedures to re-open 1SW-274 and 1SW-275 in order to re-establish an emergency service water (ESW) discharge pathway (a low cost alternative to SAMA 15, which involves logic changes)

- Use of portable generator to provide DC power to turbine-driven auxiliary feedwater (TDAFW) pump and selected instrumentation to extend the coping time in loss of alternating current power events (to power battery chargers only, and not the hydrostatic test pump as assumed in SAMA 1)

In response to the RAIs, CP&L addressed the suggested lower cost alternatives, some of which are covered by an existing procedure or are addressed by other SAMAs (Progress Energy 2007a). This is discussed further in Section G.6.2.

Although the IPE did not identify any vulnerabilities, three potential enhancements to the plant, procedures, and training at HNP were identified as part of the IPE process. These enhancements included: (1) revision of operating procedures to provide explicit instructions for locally aligning offsite AC power if the breakers fail to automatically actuate and cannot be controlled from the main control room, (2) installation of instrumentation for improved battery monitoring capability for detection of open circuits during battery charging, and (3) verification of testing and maintenance procedures for the non-vital 125 VDC battery to ensure practices are equivalent to the practices for the safety related batteries. CP&L noted that the first of these enhancements had been implemented, and that the last had been verified to have already been the plant practice, therefore requiring no plant changes.

The enhancement that has not been implemented at HNP is to install instrumentation for improved battery monitoring capability. In the ER, CP&L noted that procedures have been implemented to mitigate the non-vital 125V DC battery failures (Progress Energy 2006). SAMA 2 is proposed as an alternative to this IPE enhancement, which would change the emergency bus power supply from the unit auxiliary transformers (UATs) to the startup transformers (SUTs). CP&L stated that this would eliminate the dependence on non-vital DC to swap power supplies after a trip. The NRC staff requested CP&L to evaluate the costs and benefits associated with the installation of instrumentation for improved battery monitoring capability (NRC 2007). This results of this assessment are addressed in Section G.6.2.

Based on this information, the NRC staff concludes that the set of SAMAs evaluated in the ER, together with those identified in response to NRC staff RAIs, addresses the major contributors to internal event CDF.

CP&L identified HNP-specific candidate SAMAs for external events using the HNP IPEEE. This included reconsideration of any previously rejected or incompleted plant changes identified in the IPEEE. A total of 3 SAMAs (one seismic- and two fire-related SAMAs) were identified to address external events. As a result of the seismic portion of the IPEEE, thirteen items were found to have minor interaction, housekeeping, or maintenance issues, mostly related to missing or broken anchorage parts. Six additional items were found to be improperly secured requiring alternate means of anchoring. CP&L indicates that all of these items have been addressed (Progress Energy 2006). Some equipment was not able to be screened from further review using only the information obtained from the plant walkdown and a review of design documentation. Sixteen such items were identified and further evaluated to determine if the equipment had HCLPF capacities of 0.30g or higher. The HNP seismic IPEEE showed that the high confidence low probability of failure (HCLPF) values for all SSCs were greater than the 0.3g review level earthquake except for the RHR heat exchangers, which had a HCLPF value of 0.29g. Although CP&L considers it likely that the RHR heat exchangers could be shown to have a HCLPF value sufficient for the RLE, given the importance of loss of RHR events, CP&L included a candidate SAMA to increase the seismic capacity of these components, i.e., SAMA 22 - install upper lateral restraints on the RHR heat exchangers. CP&L noted that some electrical relays could not be assigned a HCLPF value of 0.3g during the IPEEE seismic equipment analysis but that a subsequent seismic qualification test showed that the relays exceeded the RLE requirements by a factor of 2.4 (Progress Energy 2006). Based on the licensee's efforts to identify and address seismic outliers and the expected cost associated with further seismic risk analysis and potential plant modifications, the NRC staff concludes that the opportunity for seismic-related SAMAs has been adequately explored and that it is unlikely that there are any cost-beneficial, seismic-related SAMA candidates.

The HNP fire IPEEE identified one opportunity for improvement related to fire events that was subsequently implemented. This enhancement was to incorporate procedure changes that require the operators to check the status of the power operated relief valves (PORVs) after transfer to the alternate control panel, and to close the associated block valve if a PORV is stuck open in fire-induced Main Control Room evacuation scenarios. CP&L stated that this enhancement has been implemented, but has not been credited in the IPEEE fire CDF. Nevertheless, the licensee further considered potential SAMAs for fire and identified two opportunities for additional reduction of fire risk, specifically, SAMA 1 - Install a permanent hydrostatic test pump and a 480V AC generator such that the pump can be rapidly aligned to provide seal injection in an SBO and provide power to the “B” battery chargers to eliminate the need to operate the turbine-driven AFW pump after battery depletion, and SAMA 8 - Provide the capability to align a direct feed to the B3-SB transformer and to align the “C” charging/safety injection pump (CSIP) for seal injection. The NRC staff concludes that the opportunity for fire-related SAMAs has been adequately explored and that it is unlikely that there are additional potentially cost-beneficial, fire-related SAMA candidates.

The NRC staff notes that the set of SAMAs submitted is not all inclusive, since additional, possibly even less expensive, design alternatives can always be postulated. However, the NRC staff concludes that the benefits of any additional modifications are unlikely to exceed the benefits of the modifications evaluated and that the alternative improvements would not likely cost less than the least expensive alternatives evaluated, when the subsidiary costs associated with maintenance, procedures, and training are considered.

The NRC staff concludes that CP&L used a systematic and comprehensive process for identifying potential plant improvements for HNP, and that the set of potential plant improvements identified by CP&L is reasonably comprehensive and therefore acceptable. This search included reviewing insights from the plant-specific risk studies and reviewing plant improvements considered in previous SAMA analyses. While explicit treatment of external events in the SAMA identification process was limited, it is recognized that the prior implementation of plant modifications for seismic and fire events and the absence of external event vulnerabilities reasonably justifies examining primarily the internal events risk results for this purpose.

G.4 Risk Reduction Potential of Plant Improvements

CP&L evaluated the risk-reduction potential of the 20 remaining SAMAs that were applicable to HNP. The SAMA evaluations were performed using realistic assumptions with some conservatism. On balance, such calculations overestimate the benefit and are conservative.

For most of the SAMAs, CP&L used model re-quantification to determine the potential benefits. The CDF and population dose reductions were estimated using the 2005 version of the HNP PSA model (MOR2005). The changes made to the model to quantify the impact of the SAMAs are detailed in Section E.6 of Attachment E to the ER. Table G-5 lists the assumptions considered to estimate the risk reduction for each of the evaluated SAMAs, the estimated risk reduction in terms of percent reduction in CDF and population dose, and the estimated total benefit (present value) of the averted risk. The estimated benefits reported in Table G-5 reflect the combined benefit in both internal and external events. The determination of the benefits for the various SAMAs is further discussed in Section G.6.

The NRC staff questioned the assumptions used in evaluating the benefits or risk reduction estimates of certain SAMAs provided in the ER (NRC 2007). For example, for SAMA 6, Waterproof motor operators for valves 1SW-274 and 1SW-275 to mitigate floods caused by service water line breaks, the NRC staff requested the bases of the assumption that failure to mitigate specific flood scenarios has a failure probability of 1.0E-02 following SAMA implementation. In response, CP&L showed that the averted cost risk for SAMA 6 varies by only a small amount over the range of failure probabilities from 0.0 to 0.1. In order to show that the results of this SAMA evaluation are not sensitive to the human error probability used in the modeling process, CP&L re-performed the cost benefit analysis assuming no credit for isolation maximum flow breaks and a failure probability of 0.1 for non-maximum flow breaks. SAMA 6 is not cost-beneficial even when uncertainties are considered. The NRC staff considers the assumptions, as clarified, to be reasonable and acceptable for purposes of the SAMA evaluation.

For those SAMAs that address both fire events and internal events (i.e., SAMAs 1 and 8), the internal events risk reduction was directly assessed and combined with the estimated risk reduction in fire events. For the fire events portion, CP&L reduced the total external events benefit used in the SAMA 1 and 8 calculations by excluding the risk contribution of SGTR and interfacing-systems LOCA. The IPEEE fire analysis was then used to identify the fraction of the fire risk that could be eliminated by potential enhancements in various fire areas. The product of the reduced external events benefit, the fraction of the fire risk eliminated and the estimated reliability of each proposed SAMA was used to determine the cost-risk of these SAMAs. In response to an RAI on excluding the contribution of SGTR and interfacing-systems LOCA, CP&L demonstrated that if the method of multiplying the internal events averted cost-risk by a factor of 2 is used, then SAMA 1 (which was not cost-beneficial in the ER) remains not cost-beneficial, and SAMA 8 (which was cost-beneficial in the ER) is no longer cost-beneficial. CP&L stated that the original conclusions of the ER submittal are believed to be the most appropriate for these SAMAs.

For the internal events portion of these SAMAs 1 and 8, one of the elements of the PSA that was adjusted to evaluate the benefit of these SAMAs was the human action failure basic event OPER-66. As previously discussed, CP&L discovered that they had misinterpreted the function of OPER-66 in the ER. In CP&L's response to an RAI, they demonstrated that the misinterpretation of OPER-66 resulted in an optimistic representation of SAMA 1 and had no impact on the conclusions regarding SAMA 8 (Progress 2007b).

For the SAMA that specifically addresses seismic events (i.e., SAMA 22 - Installation of upper lateral restraints on the RHR heat exchangers), CP&L assumed that 100 percent of the non-fire external events contributions are due to seismic events, 25 percent of the total seismic risk is attributable to the RHR heat exchangers, and the lateral restraints are 100 percent effective at preventing seismically induced failure. This SAMA was assumed to have no additional benefits in internal events.

The NRC staff has reviewed CP&L's bases for calculating the risk reduction for the various plant improvements and concludes that the rationale and assumptions for estimating risk reduction are reasonable and generally conservative (i.e., the estimated risk reduction is higher than what would actually be realized). Accordingly, the NRC staff based its estimates of averted risk for the various SAMAs on CP&L's risk reduction estimates.

G.5 Cost Impacts of Candidate Plant Improvements

CP&L estimated the costs of implementing the 20 candidate SAMAs through the application of engineering judgement and use of other licensees' estimates for similar improvements. The cost estimates conservatively did not include the cost of replacement power during extended outages required to implement the modifications, nor did they include contingency costs associated with unforeseen implementation obstacles. In response to a request for additional information, the licensee indicated that the cost estimates provided in the ER also did not account for inflation, which is considered another conservatism (Progress Energy 2007a).

The NRC staff reviewed the bases for the licensee's cost estimates (presented in Section E.6 of Attachment E to the ER). For certain improvements, the NRC staff also compared the cost estimates to estimates developed elsewhere for similar improvements, including estimates developed as part of other licensees' analyses of SAMAs for operating reactors and advanced light-water reactors. In response to an RAI requesting a more detailed description of the changes associated with SAMA 2,4 and 8, CP&L provided additional information detailing the analysis, procedure changes and modifications included in the cost estimated of each improvement (Progress 2007b). The NRC staff reviewed the costs and found them to be reasonable, and generally consistent with estimates provided in support of other plants' analyses.

The NRC staff concludes that the cost estimates provided by CP&L are sufficient and appropriate for use in the SAMA evaluation.

Table G-5. SAMA Cost Benefit Screening Analysis for HNP[a]

SAMA	Assumptions	% Risk Reduction		Total Benefit Using 3% Discount Rate[b] ($)	Cost ($)
		CDF	Population Dose		
1 - Install a permanent, hydrostatic test pump (or alternate pump) with 480V AC generator for seal injection and to provide power to the "B" battery chargers[c]	Internal Events: Set a new basic event for failure of alternate seal injection to 0.1, and reduce operator failure to align 480V AC generator to the battery charger by 50 percent	33	6	235,000	
	Fire Events: Eliminate 90 percent of the CDF for all applicable fire scenarios, not including SGTR and ISLOCA	32 [based on 39.4x.9x8.26 e-6/9.24e-6	4 [based on 39.4x.9x3.2 5/28.97]	155,000	
	Combined			390,000	1,000,000
2 – Change 1D and 1E Buses to be normally aligned to an off-site power source	Eliminate loss of non-vital 125V DC power as contributors to failures of buses 1D and 1E, and to failure of providing power to emergency buses 1A-SA and 1B-	2	1	59,000	200,000
3 – Increase capacity of containment fan coolers for heat removal when RHR cooling unavailable and provide sump suction for HPSI	Include credit for injection and RHR heat removal, add event (with failure probability of 1E-2) for new sump suction line and booster pump for CSIPs	7	<1	34,000	565,000
4 – Develop procedures for RWST makeup using firewater and boric acid addition [see response to RAI 6.a.i]	Include credit for makeup in SGTR events by charging the corresponding sequence flag of the relevant contributions to 1E-1	7	1	62,000	150,000

Table G-5. SAMA Cost Benefit Screening Analysis for HNP[a]

SAMA	Assumptions	% Risk Reduction		Total Benefit Using 3% Discount Rate[b] ($)	Cost ($)
		CDF	Population Dose		
6 – Waterproof motor operators for valves 1SW-274 and 1SW-275	**Reduce the flooding initiating event frequency by two orders of magnitude**	**8**	**2**	**110,000**	**150,000**
7 – Passive secondary side cooling system	Create event with failure probability of 1E-2 to represent operation of passive secondary side heat removal system	14	1	82,000	1,700,000
8 – Provide the capability to align a direct feed to the 1B3-SB transformer to preclude battery depletion and to provide alternate seal cooling by aligning the "C" CSIP for seal injection[c]	**Internal Events: Create event with failure probability of 0.1 for operator error when diagnosing and aligning the alternate seal cooling**	**5**	**<1**	**22,000**	
	Fire Events: Eliminate all of the CDF for all applicable fire scenarios, not including SGTR and ISLOCA	**57,[based on (63.4 x 8.26e-6) / 9.24e-6]**	**7,[based on (63.4x3.25) / 28.97]**	**280,000**	
	Combined			**300,000**	**300,000**
9 – Proceduralize actions to open EDG room doors and implement portable fans on loss of HVAC	Changed probability of events representing the major contributors to loss of EDG HVAC to 0	7	1	94,000	70,000
10 – Install a main control room power interrupt switch for alternate SCRAM capability	Reduced probability for event representing the conditions under which the control room trip action is not possible by two orders of magnitude	2	<1	11,000	50,000

Table G-5. SAMA Cost Benefit Screening Analysis for HNP[a]

SAMA	Assumptions	% Risk Reduction: CDF	% Risk Reduction: Population Dose	Total Benefit Using 3% Discount Rate[b] ($)	Cost ($)
11 – Automate emergency boration initiation	Changed probability for event representing manual emergency boration operation from 1 to 0	2	<1	8,000	400,000
12 – Waterproof motor operators for valves 1SW-39 and 40 and add sump level indication for the 216 foot level to the MCR	Reduce the flooding initiating event frequency by two orders of magnitude	4	1	61,000	275,000
13 – Waterproof motor operators for valves 1SW-39 and 40, add sump level indication in the MCR, and add logic and sensors to trip NSW pumps on high water level in the Service Water Pipe Tunnel and the RAB	Reduce the initiating event frequency for flood scenario 1/2/5 by a multiplicative of 5E-3	8	2	110,000	225,000
14 – Provide alternate AFW suction	Include credit for alignment of ESW to the AFW pump suction lines in non-ATWS conditions to represent existing procedures and equipment	NOT ESTIMATED			
15 – Change logic for valves 1SW-274 and 275 to prevent loss of discharge path	Eliminate the risk contribution from common cause failure involving valves 1SI-107 and 1SI-3	7	2	98,000	250,000
16 – AMSAC backup to RPS scram	Include existing AMSAC logic in the logic with the operator action for manually tripping the reactor given RPS failure	1	<1	5,000	400,000

Table G-5. SAMA Cost Benefit Screening Analysis for HNP[a]

SAMA	Assumptions	% Risk Reduction		Total Benefit Using 3% Discount Rate[b] ($)	Cost ($)
		CDF	Population Dose		
17 – Replace 2 of the 5 high pressure injection valves with an alternate type of valve	Eliminate the risk contribution from common cause failure involving valves 1SI-107 and 1SI-3	2	1	60,000	500,000
18 – Proceduralize alignment of HHSI to the RHR heat exchangers during injection phase	Create new event with failure probability of 1E-1 to represent operator action governing the alignment if the unisolated suction path and assume that alignment can be performed in time to prevent seal damage given failure of the normally	2	1	40,000	175,000
19 – Replace "A" and "B" instrument air compressors with 100 percent capacity compressors	Changed logic such that either the A or B (as opposed to both A and B) air compressor could carry the balance of plant loads to maintain the plant on-line and avoid a plant trip	2	<1	9,000	50,000
21 – Swing 6.9kV AC EDG	Eliminate the risk contribution from failures that could be mitigated by availability of a swing EDG (all LOOP contributors, loss of bus contributors and failure combinations including EDG start and run failures)	31	6	410,000	3,400,000

Table G-5. SAMA Cost Benefit Screening Analysis for HNP[a]

SAMA	Assumptions	% Risk Reduction		Total Benefit Using 3% Discount Rate[b] ($)	Cost ($)
		CDF	Population Dose		
22 – Install upper lateral restraints on the RHR heat exchangers[c]	Eliminate all seismically-induced failures of RHR heat exchangers	4	4	75,000	350,000

(a) SAMAs in bold are potentially cost beneficial

(b) Estimated benefits reflect revised values provided after correction of SECPOP2000 economic data file errors (Progress Energy 2007d)

(c) Estimated benefits are derived from information provided in the ER (Progress Energy 2006) and are stated as a percentage reduction of risk from external events.

G.6 Cost-Benefit Comparison

CP&L's cost-benefit analysis and the NRC staff's review are described in the following sections.

G.6.1 CP&L's Evaluation

The methodology used by CP&L was based primarily on NRC's guidance for performing cost-benefit analysis, i.e., NUREG/BR-0184, *Regulatory Analysis Technical Evaluation Handbook* (NRC 1997a). The guidance involves determining the net value for each SAMA according to the following formula:

Net Value = (APE + AOC + AOE + AOSC) - COE, where

APE = present value of averted public exposure ($)

AOC = present value of averted offsite property damage costs ($)

AOE = present value of averted occupational exposure costs ($)

AOSC = present value of averted onsite costs ($)

COE = cost of enhancement ($)

If the net value of a SAMA is negative, the cost of implementing the SAMA is larger than the benefit associated with the SAMA and it is not considered cost-beneficial. CP&L's derivation of each of the associated costs is summarized below.

Revision 4 of NUREG/BR-0058 states that two sets of estimates should be developed: one at 3 percent and one at 7 percent (NRC 2004). CP&L provided both sets of estimates (Progress Energy 2006).

Averted Public Exposure (APE) Costs

The APE costs were calculated using the following formula:

APE = Annual reduction in public exposure (Δperson-rem per year)

x monetary equivalent of unit dose ($2000 per person-rem) x present value conversion factor (15.04 based on a 20-year period with a 3-percent discount rate).

As stated in NUREG/BR-0184 (NRC 1997a), it is important to note that the monetary value of the public health risk after discounting does not represent the expected reduction in public health risk due to a single accident. Rather, it is the present value of a stream of potential losses extending over the remaining lifetime (in this case, the renewal period) of the facility. Thus, it reflects the expected annual loss due to a single accident, the possibility that such an accident could occur at any time over the renewal period, and the effect of discounting these potential future losses to present value. For the purposes of initial screening, which assumes elimination of all severe accidents due to internal events, CP&L calculated an APE of approximately $871,000 for the 20-year license renewal period.

<u>Averted Offsite Property Damage Costs (AOC)</u>

The AOCs were calculated using the following formula:

AOC = Annual CDF reduction

x offsite economic costs associated with a severe accident (on a per-event basis)

x present value conversion factor.

For the purposes of initial screening which assumes all severe accidents due to internal events are eliminated, CP&L calculated an annual offsite economic risk of about $43,000 based on the Level 3 risk analysis. This results in a discounted value of approximately $647,000 for the 20-year license renewal period.

<u>Averted Occupational Exposure (AOE) Costs</u>

The AOE costs were calculated using the following formula:

AOE = Annual CDF reduction

x occupational exposure per core damage event

x monetary equivalent of unit dose

x present value conversion factor.

CP&L derived the values for averted occupational exposure from information provided in Section 5.7.3 of the regulatory analysis handbook (NRC 1997a). Best estimate values provided for immediate occupational dose (3300 person-rem) and long-term occupational dose (20,000 person-rem over a 10-year cleanup period) were used. The present value of these doses was calculated using the equations provided in the handbook in conjunction with a monetary equivalent of unit dose of $2000 per person-rem, a real discount rate of 3 percent, and a time period of 20 years to represent the license renewal period. For the purposes of initial screening, which assumes all severe accidents due to internal events are eliminated, CP&L calculated an AOE of approximately $5,700 for the 20-year license renewal period.

Averted Onsite Costs

Averted onsite costs (AOSC) include averted cleanup and decontamination costs and averted power replacement costs. Repair and refurbishment costs are considered for recoverable accidents only and not for severe accidents. CP&L derived the values for AOSC based on information provided in Section 5.7.6 of NUREG/BR-0184, the regulatory analysis handbook (NRC 1997a).

CP&L divided this cost element into two parts – the onsite cleanup and decontamination cost, also commonly referred to as averted cleanup and decontamination costs, and the replacement power cost.

Averted cleanup and decontamination costs (ACC) were calculated using the following formula:

ACC = Annual CDF reduction

x present value of cleanup costs per core damage event

x present value conversion factor.

The total cost of cleanup and decontamination subsequent to a severe accident is estimated in NUREG/BR-0184 to be $\$1.3 \times 10^9$ (discounted over a 10-year cleanup period). This value is integrated over the term of the proposed license extension. For the purposes of initial screening, which assumes all severe accidents due to internal events are eliminated, CP&L calculated an ACC of approximately $180,000 for the 20-year license renewal period.

Long-term replacement power costs (RPC) were calculated using the following formula:

RPC = Annual CDF reduction

x present value of replacement power for a single event

x factor to account for remaining service years for which replacement power is required

x reactor power scaling factor

CP&L based its calculations on the EPU value of 900 megawatt electric (MWe), which is the current electrical output for HNP. Therefore, CP&L applied a power scaling factor of 900/910 to determine the replacement power costs. For the purposes of initial screening, which assumes all severe accidents due to internal events are eliminated, CP&L calculated an RPC of approximately $50,000 and an AOSC of approximately $230,000 for the 20-year license renewal period.

Using the above equations, CP&L estimated the total present dollar value equivalent associated with completely eliminating severe accidents due to internal events at HNP to be about $1.75M. Use of a multiplier of two to account for external events increases the value to $3.5M and represents the dollar value associated with completely eliminating all internal and external event severe accident risk at HNP, also referred to as the Modified Maximum Averted Cost Risk (MMACR).

CP&L's Results

If the implementation costs for a candidate SAMA exceeded the calculated benefit, the SAMA was considered not to be cost-beneficial. In the baseline analysis contained in the ER, (using a 3 percent discount rate), CP&L identified one potentially cost-beneficial SAMAs. The potentially cost-beneficial SAMA is:

- SAMA 9 - Proceduralize actions to open emergency diesel generator (EDG) room doors and implement portable fans on loss of heating ventilation and air-conditioning (HVAC).

CP&L performed additional analyses to evaluate the impact of parameter choices and uncertainties on the results of the SAMA assessment (Progress Energy 2006). Using a 7 percent discount rate, SAMA 9 would not be cost-beneficial. If the benefits (based on a 3 percent discount rate) are increased by a factor of 1.5 to account for uncertainties, SAMA 9 plus two additional SAMA candidates were determined to be potentially cost-beneficial:

- SAMA 6 - Waterproof motor operators for valves 1SW-274 and 1SW-275 to mitigate floods caused by service water line breaks

- SAMA 8 - Provide the capability to align a direct feed to the 1B3-SB transformer to preclude battery depletion, and to align the "C" charging/safety injection pump (CSIP) for seal injection

Subsequent to the ER, three problems related to use of the SECPOP2000 code were identified. These deal with: (1) a formatting error in the regional economic data block text file generated by SECPOP2000 for input to MACCS2 which results in MACCS2 mis-reading the data, (2) an error associated with the formatting of the COUNTY97.DAT economic database file used by SECPOP2000 which results in SECPOP2000 processing incorrect economic and land use data, and (3) gaps in the numbered entries in the COUNTY97.DAT economic database file which result in any county beyond county number 955 being handled incorrectly in SECPOP2000. CP&L provided revised benefit estimates using corrected input to MACCS2 (Progress Energy 2007d). The correction of the identified problems resulted in an increase in the maximum averted cost risk of about 14 percent, and a change in the estimated benefits for the various SAMAs ranging from a 10 percent reduction in benefits to a 14 percent increase in benefits.

This correction resulted in no change to the Phase I screening results, and resulted in no additional SAMAs becoming potentially cost-beneficial in either the baseline analysis or the uncertainty analysis. Thus, the overall results of the SAMA assessment were not affected.

The potentially cost-beneficial SAMAs and CP&L's plans for further evaluation of these SAMAs are discussed in more detail in Section G.6.2.

G.6.2 Review of CP&L's Cost-Benefit Evaluation

The cost-benefit analysis performed by CP&L was based primarily on NUREG/BR-0184 (NRC 1997a) and was implemented consistent with this guidance.

To account for external events, CP&L multiplied the internal event benefits by a factor of 2, and for each SAMA, except those SAMAs that specifically address external events (i.e., SAMAs 1, 8, and 22). Doubling the benefit for these SAMAs is not appropriate since these SAMAs are specific to external events or, as in the case for the two fire-related SAMAs, have a targeted external event impact and would be underestimated if calculated using the doubling approach. Although the CDF from external events is a factor of 1.4 greater than the CDF for internal events, given the licensee's demonstration of conservatism in the external events CDF, and the licensee's demonstration that use of a higher multiplier would not affect the SAMA screening, the NRC staff agrees that the factor of 2 multiplier for external events is reasonable.

CP&L considered the impact that possible increases in benefits from analysis uncertainties would have on the results of the SAMA assessment. In the ER, CP&L presents the results of an uncertainty analysis of the internal events CDF which indicates that the 95th percentile value is a factor of 1.5 times the mean CDF. CP&L reexamined the initial set of SAMAs to determine if any additional Phase I SAMAs would be retained for further analysis if the benefits (and Modified Maximum Averted Cost-Risk) were increased by a factor of 1.5. One such Phase I SAMA was identified: SAMA 20 - Install alternative high pressure system. However, based on further consideration of the limited benefit of eliminating the events addressed by this SAMA, CP&L concluded that this SAMA would not be cost-beneficial even if it were completely reliable. The specific rationale is provided in Section E.7.2.1 of the ER.

CP&L also considered the impact on the Phase II screening if the estimated benefits were increased by a factor of 1.5 (in addition to the factor of 2 multiplier for external events). Two additional SAMAs became cost-beneficial in CP&L's analysis (SAMAs 6 and 8, as described above). Although not cost-beneficial in the baseline analysis, CP&L included these two SAMAs within the set of potentially cost-beneficial SAMAs that they intend to examine further for implementation.

CP&L did not develop a cost-risk analysis for the Phase II SAMA 14 - Alternate Auxuliary Feedwater (AFW) suction. In the ER, CP&L noted that the costs and benefits were not quantified for SAMA-14 because once existing procedures and equipment for the Emergency

Service Water (ESW) to AFW suction line were credited, most condensate storage tank flow path failures were eliminated. Any flow path failure which remained had RRW values of 1.0. Therefore, the benefits and costs of this SAMA was not evaluated.

The NRC staff noted that for certain SAMAs considered in the ER, there may be alternatives that could achieve much of the risk reduction at a lower cost. The NRC staff asked the licensee to evaluate several lower cost alternatives to the SAMAs considered in the ER, including SAMAs that had been found to be potentially cost-beneficial at other PWR plants. These alternatives were: (1) changes to procedures to re-open 1SW-274 and 1SW-275 in order to re-establish an ESW discharge pathway, (2) the use of a portable generator to provide DC power to the TDAFW pump and selected instrumentation to extend the coping time in loss of AC power events, and (3) installation of instrumentation for improved battery monitoring capability (NRC 2007). CP&L provided a further evaluation of these alternatives, as summarized below.

- Changes to procedures to re-open 1SW-274 and 1SW-275 (a low cost alternative to SAMA 15, which involves logic changes) - No credit can be given for this proposed SAMA due to the limited time window. The cooling requirements of the EDG necessitate that the valves be re-opened very quickly. Clearing or bypassing the safety injection signal would be required before the valves could be re-opened. The cooling flow would be further delayed by the time required to operate the valves and the time for the valves to stroke. These time constraints would prevent cooling flow to the EDG before damage would occur.

- Use of portable generator to provide DC power to TDAFW pump and selected instrumentation to extend the coping time (a low cost alternative to SAMA 1, which involves also powering a hydrostatic test pump) - Based on a bounding analysis in which the human error probability for TDAFW control was set to zero, this proposed SAMA provides limited benefit and is not cost-beneficial even when considering uncertainties. One of the elements of the PSA that was adjusted to evaluate the benefit of this proposed improvement was the human action failure basic event OPER-66 (Progress 2007a). As previously discussed, CP&L discovered that it had misinterpreted the function of OPER-66. In CP&L's response to an RAI, they stated that the misinterpretation of OPER-66 had a significant impact on the estimated benefit associated with this improvement. As a result, CP&L provided a revised assessment of this improvement which resulted in an averted cost-risk of $48,000 and a cost of implementation of $100,000. If the 95th percentile results are used, the averted cost-risk increases to $72,000. These results demonstrate that the enhancement is still not cost-beneficial (Progress 2007b).

- Installation of instrumentation for improved battery monitoring capability, especially for detection of open circuit faults while the bus is carried by the battery charger - This improvement provides minimum benefit as there is a connection between the non-vital 125 VDC battery and the bus, precluding an "open circuit fault". In addition, there are periodic proceduralized checks, and main control room alarms related to the non-vital battery charger, which would identify a loss of charge on the battery. As a bounding analysis shows that elimination of all non-vital DC system failures would achieve a smaller benefit than the minimum cost of SAMAs requiring a hardware change, this proposed SAMA is not cost-beneficial.

The NRC staff notes that the three potentially cost-beneficial SAMAs 6, 8, and 9 identified in either CP&L's baseline analysis, or uncertainty analysis, are included within the set of SAMAs that CP&L will consider for implementation.

The NRC staff concludes that, with the exception of the potentially cost-beneficial SAMAs discussed above, the costs of the SAMAs evaluated would be higher than the associated benefits.

G.7 Conclusions

CP&L compiled a list of 22 SAMAs based on a review of the most significant basic events from the current plant-specific PSA, insights from the plant-specific IPE and IPEEE, Phase II SAMAs from license renewal applications for other plants, and review of other industry documentation. An initial screening removed SAMA candidates that (1) were determined not applicable to the HNP design, or (2) had estimated costs that would exceed the dollar value associated with completely eliminating all severe accident risk at HNP. Based on this screening, 2 SAMAs were eliminated leaving 20 candidate SAMAs for evaluation.

For the remaining SAMA candidates, more detailed evaluation was performed as shown in Table G-5. The cost-benefit analyses in the ER showed that one SAMA candidate was potentially cost-beneficial in the baseline analysis (SAMA 9). CP&L performed additional analyses to evaluate the impact of parameter choices and uncertainties on the results of the SAMA assessment. As a result, two additional SAMAs (SAMAs 6 and 8) were identified as potentially cost-beneficial. CP&L has indicated that all three potentially cost-beneficial SAMAs (6, 8, and 9) will be considered for implementation at HNP.

The NRC staff reviewed the CP&L analysis and concludes that the methods used and the implementation of those methods were sound. The treatment of SAMA benefits and costs support the general conclusion that the SAMA evaluations performed by CP&L are reasonable and sufficient for the license renewal submittal. Although the treatment of SAMAs for external events was somewhat limited, the likelihood of there being cost-beneficial enhancements in this area was minimized by improvements that have been realized as a result of the IPEEE process, and inclusion of a multiplier to account for external events.

The NRC staff agrees with CP&L's identification of areas in which risk can be further reduced in a cost-beneficial manner through the implementation of the identified, potentially cost-beneficial SAMAs. Given the potential for cost-beneficial risk reduction, the NRC staff agrees that further evaluation of these SAMAs by CP&L is warranted. However, these SAMAs do not relate to adequately managing the effects of aging during the period of extended operation. Therefore, they need not be implemented as part of license renewal pursuant to Title 10 of the *Code of Federal Regulations*, Part 54.

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11. ABSTRACT *(200 words or less)*

This supplemental environmental impact statement (SEIS) has been prepared in response to an application submitted by Carolina Power and Light Company, doing business as Progress Energy Carolinas, Inc. (CP&L) to the Nuclear Regulatory Commission (NRC) to renew the Operating License for Shearon Harris Nuclear Power Plant, Unit 1 (HNP) for an additional 20 years under 10 CFR Part 54. The SEIS includes the NRC staff's analysis that considers and weighs the environmental impacts of the proposed action, the environmental impacts of alternatives to the proposed action, and mitigation measures available for reducing or avoiding adverse impacts. It also includes the staff's recommendation regarding the proposed action.

The NRC staff's preliminary recommendation is that the Commission determine that the adverse environmental impacts of license renewal for HNP are not so great that preserving the option of license renewal for energy-planning decision makers would be unreasonable. The recommendation is based on (1) the analysis and findings in the GEIS; (2) the Environmental Report submitted by CP&L; (3) consultation with Federal, State, and local agencies; (4) the staff's own independent review; and (5) the staff's consideration of public comments.

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